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ABSTRACT

This data processing curriculum contains 23 units of instruction for an articulated program in the occupations of data processing. It consists of an introductory mini-series on data-processing concepts, as well as data entry operator, computer operator, programmer, and systems analyst units. Introductory materials include program goals and objectives, possible career paths, and a course map. Job analysis, competencies, and task lists follow for data entry operator, computer operator, computer programmer, and systems analyst. Also for each is provided the D.O.T. code number. A sample student achievement report is provided. Titles of the units are Basic Data Processing Concepts and Functions, Historical Development of Data Processing, Common Features of Data Processing Systems, Programming Concepts and Documentation, Data Processing Applications and Careers, Offline Data Entry Devices, Online Computer Terminal, Data Entry Formats, Computer Operations, Preparing Jobs for Execution, Data Control Functions, Operations and Maintenance of Peripheral Equipment, Data Support Functions, Supervision of Data Processing Functions, Introduction to Problem Analysis, Introduction to Flowcharting, Introduction to Programming Languages, Introduction to Documentation, Program Maintenance, Analyzing Existing Systems, Systems Specifications, Design and Develop Systems, and System Implementation. Each unit contains unit and specific objectives, suggested instructor and student activities, instructional materials and references, pretest, information sheet, transparency masters, assignment sheet(s), test, and answer key. (YLB)

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BUSINESS/OFFICE OCCUPATIONS

DATA PROCESSING

* DATA PROCESSING CONCEPTS
* DATA ENTRY OPERATOR
* COMPUTER OPERATOR
* COMPUTER PROGRAMMER
* SYSTEMS ANALYST

State Department of Education
Vocational-Technical Division
100-A Cordell Hull Building
Nashville, TN 37219

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Student Units:

- Basic Data Processing Concepts & Functions
- Historical Development of Data Processing
- Common Features of Data Processing Systems
- Programming Concepts & Documentation
- Data Processing Applications & Careers
- Offline Data Entry Devices
- Online Computer Terminal
- Data Entry Formats
- Computer Operations
- Preparing Jobs for Execution
- Data Control Functions
- Operations & Maintenance of Peripheral Equipment
- Data Support Functions
- Supervision of Data Processing Functions
- Introduction to Problem Analysis
- Introduction to Flowcharting
- Introduction to Programming Languages
- Introduction to Documentation
- Program Maintenance
- Analyzing Existing Systems
- Systems Specifications
- Design & Develop Systems
- System Implementation

PREFACE

Each time something is sold, rented, manufactured, transported, stored, or paid for, a record of the transaction is processed. And, most likely, a computer played an integral part of the transaction.

In the past twenty years, computers have pervaded almost every aspect of our life. They control train and plane schedules, check inventories, print checks, score test exams, figure payrolls, and hundreds of other jobs. Because of this surge in computerization, thousands of job opportunities have been created.

Data processing programs in the secondary schools are still developmental in nature. Because of rapid changes in technology, there is a continual need for additional training for data processing specialists.

As high schools start to design their data processing programs, they must look at the data processing staff who will teach these classes. The teaching staff should have taken courses and had practical experience in computer concepts, data entry, computer operations, computer programming, and have a thorough understanding of how computer applications are used in industry and business. What type of data processing program the school initiates will be determined by the typee of computer system the school has, if any.

Through the use of the following modules, students will be introduced to the competencies and tasks needed to perform the duties of the various occupations. These modules have been designed to demonstrate to the student and teacher the progress that has been made in the student's knowledge of data processing. Students will learn the terminology, perform paper and pencil activities, and engage in jobs/projects.

Before starting each module, the student should be instructed to take the pretest. This will give the instructor an idea of what each student already knows about a particular subject. After completion of the module, a similar test will be given to measure what had been learned as a result of studying the module. The tests are written to measure only the material covered in the module.

INSTRUCTIONS FOR STUDENT UNITS

The INSTRUCTOR'S GUIDE for the DATA PROCESSING CURRICULUM contains all materials needed to form a STUDENT MODULE. The STUDENT MODULE will consist of all pages of the INSTRUCTOR'S GUIDE EXCEPT:

1. Suggested Activity Sheets
2. Answer Sheets to:
    a. Assignment Sheets
    b. Pretests
    c. Tests
3. Pretests
4. Tests

INTRODUCTION TO USE OF CURRICULUM

The Data Processing Curriculum units are designed to give the student training in the data preparation skills needed for employment in business and industry. In addition to these data preparation skills, there are other necessary skill areas and knowledge which need to be developed by the student to become fully competent in data processing. For a thorough review of all competencies and minimum performance levels, the instructor must refer to the "Education for Office Careers/Articulated Curriculum Guide" published by the Tennessee State Department of Education.

The "Articulated Curriculum Guide" provides, under each occupational area (designated by the "Dictionary of Occupational Titles" number and the U.S.O.E. Codes), task categories with performance levels, a comprehensive job description, and a course outline. Through the instructor's reference to this "Guide," the standards expected by the average business for employment at the entry level can be found.

The Data Processing Curriculum consists of an introductory mini-series, as well as data entry operator, computer operator, programmer, and systems analyst units. Each unit consists of an objective and prerequisite sheet, instructor/student activity and reference sheet, pretest, information sheet, assignment sheets (paper/pencil activity), job sheets (machine activity), test, and answer sheets to assignments, pretests, and tests.

In addition to completing the designated curriculum units, students must also meet the competencies and levels of performance found in the "Guide" for the job for which they are training. The "Guide" not only lists levels of performance, but also indicates the course outlines that will help the student to reach these levels.

It is through the dual use of the "Data Processing Curriculum" and the "Articulated Curriculum Guide" that students can obtain the competencies needed to complete all tasks for each of the four job categories (data entry operator, computer operator, programmer, and systems analyst). The mini-unit series is an excellent source of knowledge on data processing concepts. The mini-units can be used in any course to introduce data processing to the class.

Through the use of the "Articulated Guide" and "Data Processing Curriculum," the student will gain an understanding of the roles in data processing, the attitudes and work profile of successful data processors, and the basic skills and principles needed in the various data processing jobs.

PROGRAM GOALS AND OBJECTIVES

The objectives of this program of instruction are:

- To train qualified students for entry level positions in the data processing field in business, industry, and institutions.
- To provide academic training in the area of data processing concepts, computer programming, computer operations, systems concepts, and communication/supervisory functions.
- To prepare the student for interaction with peers, superiors, and subordinates on the job.
- To enable the student to communicate effectively.
- To train the student for skill in the operation, control, and management of computer systems, equipment, and other data processing devices.
- To provide a curriculum of maximum flexibility for the various types of school programs.

The training students receive in data processing should give them a better understanding of how data processing effects their lives. All goals of the data processing program must meet the needs of the business community.

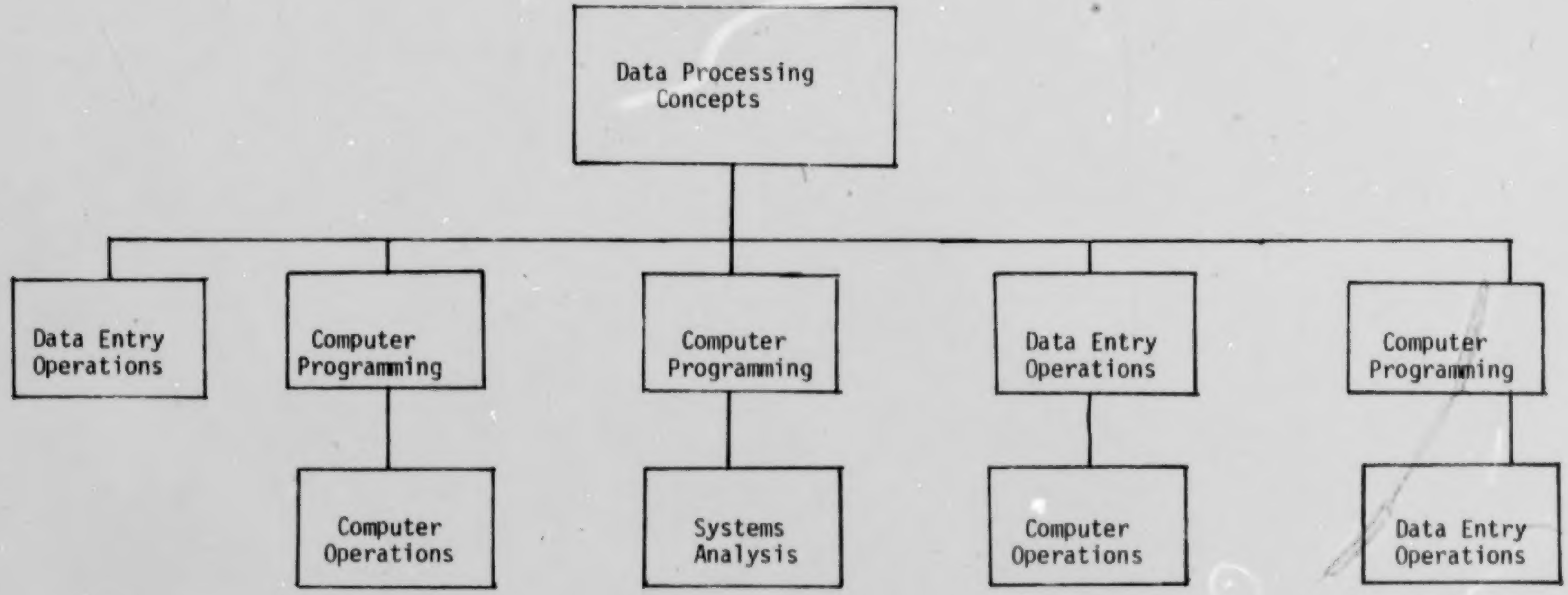
ARTICULATION/CREDIT

It is the intention of this curriculum that these units of instruction provide an articulated program in the occupations of data processing. Modules have been developed to cover all competencies needed to perform the various duties of data processors. Competencies and tasks may often be repeated. Once a competency or task has been covered it will not be repeated.

After successful completion of all modules, the student will have performed those tasks necessary in an occupation. If the teacher (or student) feels the student may already have certain knowledge in that field, the pretest should be given to determine the extent of that knowledge. If a score of 90% or above is obtained, the student should then go to the next module. If a student has previously (and satisfactorily) completed modules (as in another course), the scores of the pretest/postest should be given to the teacher so the student will not have to cover that same material again.

To have an articulated curriculum, the institution must agree to grant credit to students with demonstrated proficiency in certain tasks. A policy must be developed by which that credit may be granted.

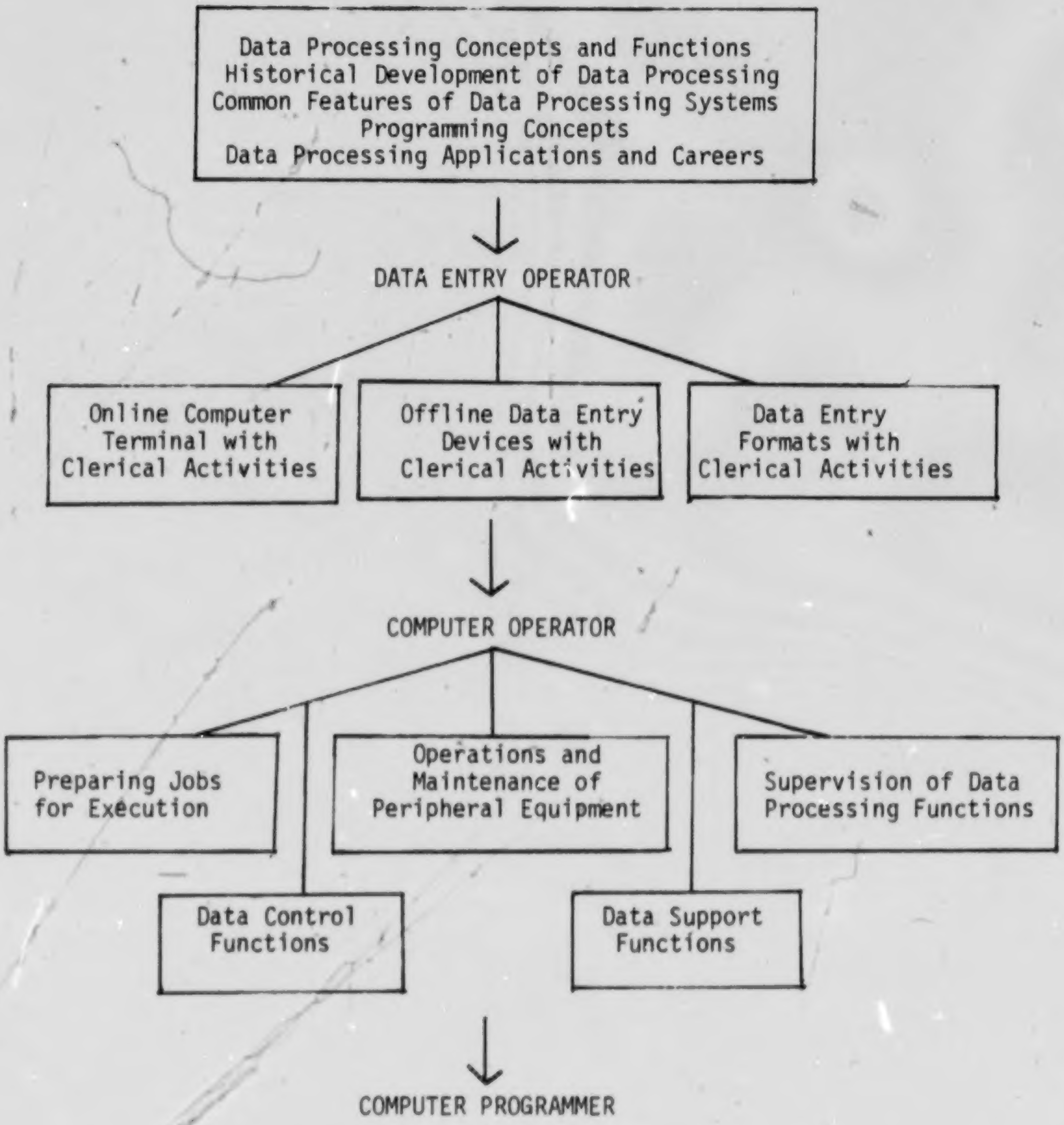
POSSIBLE CAREER PATHS

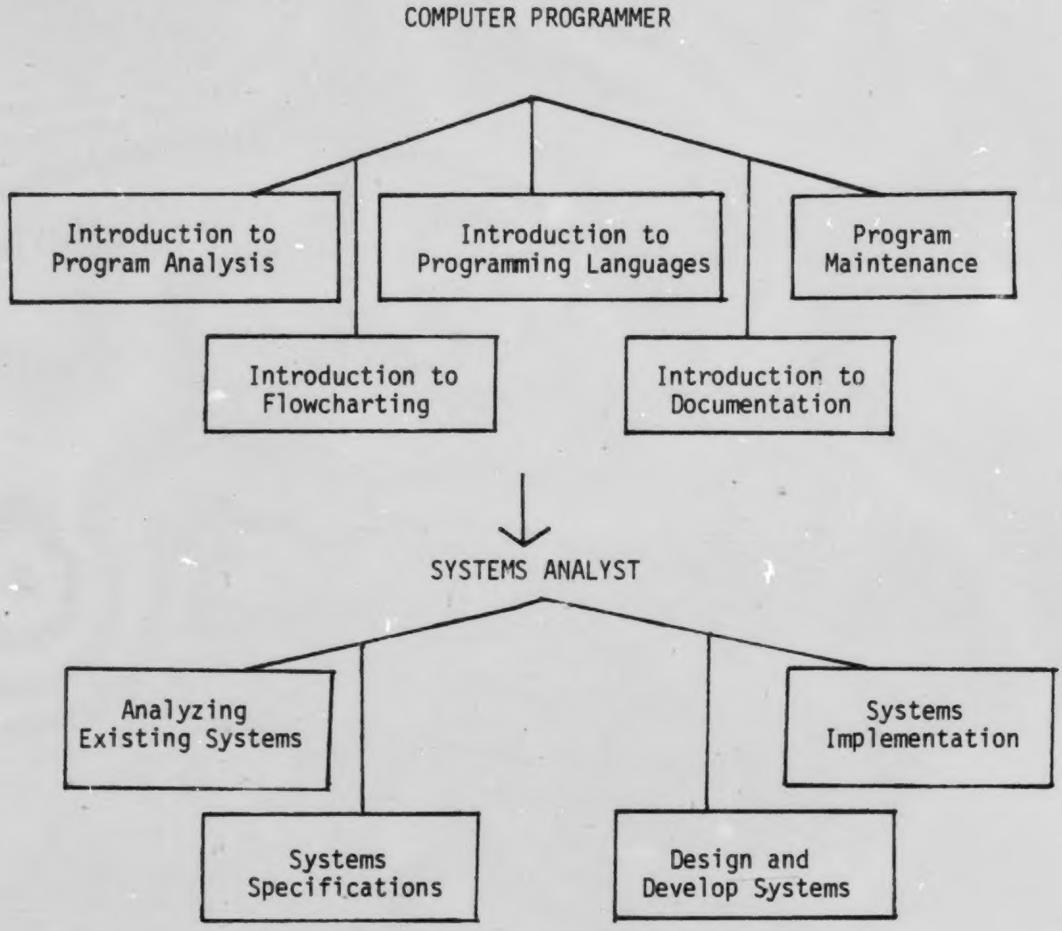

Data Processing Concepts
Data Entry Operations
Computer Programming
Computer Operations
Computer Programming
Systems Analysis
Data Entry Operations
Computer Operations
Computer Programming
Data Entry Operations

This diagram illustrates the possible sequence of courses that a student may wish to follow depending upon his interests. It is suggested that data entry training be available more often than the others to allow flexibility in the student's selection of courses. It can also be noted that no particular programming language is suggested. The instructors may teach the language(s) appropriate to the needs of the community.

COURSE MAP

DATA PROCESSING CONCEPTS


Data Processing Concepts and Functions
Historical Development of Data Processing
Common Features of Data Processing Systems
Programming Concepts
Data Processing Applications and Careers
DATA ENTRY OPERATOR
Online Computer Terminal with Clerical Activities
Offline Data Entry Devices with Clerical Activities
Data Entry Formats with Clerical Activities
COMPUTER OPERATOR
Preparing Jobs for Execution
Operations and Maintenance of Peripheral Equipment
Supervision of Data Processing Functions
Data Control Functions
Data Support Functions
COMPUTER PROGRAMMER


COMPUTER PROGRAMMER
Introduction to Program Analysis
Introduction to Programming Languages
Program Maintenance
Introduction to Flowcharting
Introduction to Documentation
SYSTEMS ANALYST
Analyzing Existing Systems
Systems Implementation
Systems Specifications
Design and Develop Systems

DATA ENTRY OPERATOR JOB ANALYSIS

NATURE OF WORK

Data entry operators are responsible for the operation of alphabetic and numeric computer compatible equipment for transcribing data from source materials onto computer compatible media. These media include, but are not limited to, punchcards, paper tape, magnetic tape, cassettes, and disks.

Data entry operators verify the accuracy of the data and insure the correct sequence of data placed on input devices. While working in a data entry system, they may enter data into the system by operating a terminal whereby the input is directed online to a system.

ANALYSIS OF JOB PREREQUISITES

Persons planning on entering this career should complete a business or college entrance program during high school with courses in typing, office practices, data processing, and business machines operation. Good spelling, punctuation, and grammer as well as skill in proofreading are important.

Some employers will train employees with typing skills to operate data entry equipment, and some firms send selected employees to training programs in machine operation conducted by manufacturers of the equipment being used. However, the majority prefer to hire applicants who have completed specialized courses in the operation of data processing machines. These courses are offered by high schools, business schools, junior colleges and vocational/technical institutes.

Normal eyesight and hearing, good eye-hand coordination, and above average finger dexterity are necessary in this career. Aspirants should be alert and dependable, and possess a good memory, emotional stability, and accurate work habits. They should also be able to concentrate, follow oral and written instructions, and get along well with others.

Beginning employees usually complete a period of on-the-job training and learn the methods and procedures used by the firm for transcribing data by working under the direction of experienced operators.

ANALYSIS OF JOB ATTRIBUTES

Data entry operators are employed by businesses of all types - banks, insurance companies, manufacturing firms, transportation companies, hotels, wholesale and retail firms, utility companies, and data processing firms. They also work for educational institutions, health care facilities, research organizations, and many local, state, and federal government agencies.

Employment opportunities for persons trained in data entry machine operation are expected to be good through the mid-1980's. The growing installation of computers in businesses of all sizes should create hundreds of new positions for data entry operators. These workers will also be needed to replace present operators who retire, are promoted, or leave the occupation for other reasons.

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE DATA ENTRY OPERATOR

D.O.T. 203.362,582

COMPETENCY:

The learner will be able to operate data entry equipment.

TASK:

1. Operate key to cassette equipment. (ODED)
2. Operate key to disk equipment. (ODED)
3. Operate key to tape equipment. (ODED)
4. Operate key to paper tape equipment. (ODED)
5. Operate on-line CRT equipment. (OCT)
6. Operate on-line typewriter terminals. (OCT)
7. Operate key-to-card equipment. (ODED)
8. Operate equipment to verify work. (OCT, ODED)
9. Perform routine operator maintenance on data entry machines. (OCT, ODED)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE DATA ENTRY OPERATOR

D.O.T. 203.362,582

COMPETENCY:

The learner will be able to perform clerical activities.

TASK:

1. Key data from source documents. (OCT, ODED, DEF)
2. Key programs from coding sheets.
3. Screen I/O data for obvious errors. (OCT, ODED, DEF)
4. Initiate correction of discovered errors. (OCT, ODED, DEF)
5. Log time and activities for user charges. (DCF)
6. Record and manage data files (physical - tapes, cassettes, etc.) (ODED, DEF)
7. Maintain integrity and confidentiality of data. (SDPF, DSF)
8. Maintain inventory of data processing supplies. (DSF)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE DATA ENTRY OPERATOR

D.O.T. 203.362,582

COMPETENCY:

The learner will be able to analyze data entry formats.

TASK:

1. Analyze program formats. (DEF)
2. Organize data for input. (DEF)
3. Key a program format. (DEF)
4. Test program formats. (DEF)
5. Update existing program formats.

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE DATA ENTRY OPERATOR

D.O.T. 203.362,582

COMPETENCY:

The learner will become familiar with other data processing functions.

TASK:

1. Coordinate activities with users and systems personnel. (DSF, SDPF)
2. Control basic input into data systems. (OCT, ODED)
3. Compare output with predetermined or previous data. (OCT, ODED)
4. Label and transmit. (ODED)
5. Clean and maintain data entry work area. (OCT, ODED)
6. Operate forms handling equipment. (OMPE)

COMPUTER OPERATOR JOB ANALYSIS

NATURE OF WORK

Electronic computer operators are responsible for monitoring and controlling computers according to programmed operating instructions. They ready the equipment by loading it with tapes, cards, discs, or other types of input data, and may type alternate commands into the consoles.

Computer operators may manipulate dozens of control switches and observe machines and control panels for error lights and printout messages. They clear the equipment at end of operating run and review schedule to determine next assignment.

Depending on the size and complexity of the operation and computer system, one or two persons may be able to perform all the necessary work. A very large system may require that a number of personnel be employed, each performing a specialized task.

ANALYSIS OF JOB PREREQUISITES

A high school education is the minimum requirement, but an increasing number of employers are demanding an additional several months to two years of technical school training in EDP. This training should include courses in computer mathematics, accounting, business practices, elementary programming, and operation of computers and peripheral equipment.

The employer or computer manufacturer usually provides one to two weeks of formal instruction for the specific computer system the worker will operate. On-the-job training ranges from a few months to one year.

Employers look for potential employees who are alert, able to work with extreme accuracy, and pay attention to the smallest detail. This job calls for individuals with mathematical ability, manual and finger dexterity and the ability to think and reason logically. Pateince is a valued asset for these jobs, and individuals need to be able to work in close cooperation with others as part of a team.

ANALYSIS OF JOB ATTRIBUTES

The use of data processing equipment has expanded greatly and jobs for operators have increased. Computers are commonplace in all big business operations as well as smaller operations. Working conditions are usually comfortable, well-lighted, air-conditioned modern business offices and computer rooms. In organizations where several types of equipment are located in the same area, the operators may be subject to considerable noise resulting from the operation of the machines.

Since the function of the computer system depends upon cooperative efforts of several workers, computer operating personnel generally work as a team. Depending upon the business activities conducted by the employing organization, they may work under occasional pressure to meet deadlines or to complete special data processing projects.

The employment outlook for computer operators is expected to be good through the mid-1980's. In addition to new openings created by the growing installation and/or expansion of computer systems, many openings will result from the need to replace operators who retire, are promoted, or leave their jobs for other reasons. Employment opportunities should be best for persons knowledgeable in operating several types of equipment.

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE COMPUTER OPERATOR

D.O.T. 213.132,362

COMPETENCY:

The learner will be able to operate a computer.

TASK:

1. Activate system devices. (CO)
2. Check output material to determine that job is complete. (CO)
3. Communicate with the computer through the console. (CO)
4. Maintain operational status reports. (CO)
5. Initiate steps to correct I/O errors. (CO)
6. Identify and interpret machine malfunctions and error messages. (CO)
7. Load programs. (CO)
8. Observe for abnormal termination of job. (CO)
9. Check job status. (CO)
10. Remove output from machine. (CO)
11. Utilize operation's manual. (CO)
12. Monitor telecommunications equipment. (CO)
13. Execute specific operator utilities. (CO)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE COMPUTER OPERATOR

D.O.T. 213.132,362

COMPETENCY:

The learner will be able to prepare jobs for execution.

TASK:

1. Identify jobs to be run efficiently. (PJE)
2. Determine and schedule the availability of peripheral devices needed. (PJE)
3. Select and load forms needed for a job. (PJE)
4. Determine orderly steps in running a job. (PJE)
5. Inventory media in storage. (SPDF)
6. Prepare job control parameters. (PJE)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE COMPUTER OPERATOR

D.O.T. 213.132,362

COMPETENCY:

The learner will be able to perform data control functions.

TASK:

1. Maintain standards relative to computer I/O. (DCF)
2. Distribute output to users. (SDPF)
3. Maintain Data Control Log. (DCF)
4. Screen for errors and initiate corrections. (DCF)
5. Train personnel in methods of handling I/O. (DCF)
6. Prepare backup media for appropriate storage. (DCF)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE COMPUTER OPERATOR

D.O.T. 213.132,362

COMPETENCY:

The learner will be able to maintain peripheral equipment and computer logs.

TASK:

1. Perform routine operating maintenance. (OMPE)
2. Perform minor corrective maintenance. (OMPE)
3. Coordinate service on all equipment. (OMPE)
4. Maintain Maintenance and Operational Log. (OMPE)
5. Implement approved operational changes. (CO)
6. Label and store media properly. (SDPF)
7. Perform routine housekeeping duties. (ODED, OCD)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE COMPUTER OPERATOR

D.O.T. 213,132.362

COMPETENCY:

The learner will be able to perform data processing support functions.

TASK:

1. Make recommendations for more efficient use of computer equipment. (DSF)
2. Assist in planning facility modification. (DSF)
3. Handle special requests for data processing services. (DSF)
4. Compose correspondence concerning data processing services. (DSF)
5. Maintain materials and supplies. (DSF)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE COMPUTER OPERATOR

D.O.T. 213.132.362

COMPETENCY:

The learner will operate and perform first-line maintenance on computer peripheral equipment.

TASK:

1. Operate and maintain online equipment. (CO, OMPE, DCF)
2. Operate and maintain offline equipment. (ODED, CO, OMPE)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE COMPUTER OPERATOR

D.O.T. 213.132.362

COMPETENCY:

The learner will be able to perform supervisory data processing functions.

TASK:

1. Assign priorities to computer jobs. (PJE)
2. Coordinate production schedules. (SDPF)
3. Coordinate scheduling of machine work load. (SDPF)
4. Evaluate abnormal equipment operation. (OMPE)
5. Develop and maintain computer operating procedures. (SDPF)
6. Inventory data processing supplies. (SDPF, DSF)
7. Maintain vendor operating manuals and user directives. (SDPF)
8. Monitor jobs processed and pending. (SDPF, DCF, CO)
9. Orient new user to basic services offered by the computer center. (SDPF, DSF)
10. Plan and implement approved on-the-job training. (SFPF)
11. Schedule preventive maintenance. (SDPF, OMPE)
12. Reassign duties to operators as changes occur. (SDPF, DCF)
13. Maintain security procedures. (SFPF)

COMPUTER PROGRAMMER JOB ANALYSIS

NATURE OF WORK

Programmers generally work from problem descriptions prepared by systems analysts who have examined the problem and determined the steps necessary to achieve the desired results. From the description of the systems analyst, the programmer constructs a flowchart or diagram that shows the logical steps which the computer must follow to process data. From the flowchart, the programmer then actually codes the instructions, or program, which the computer will follow using one of the languages developed for the computer, such as COBOL or BASIC. The programmer then checks the operation of the program using sample data to be sure the instructions are correct and will produce the desired information, and makes changes if necessary. The program is then ready to be run using the real data.

ANALYSIS OF JOB PREREQUISITES

Employers look for potential employees who have a high degree of reasoning ability and are capable of understanding an overall problem as well as work with minute details. The job calls for patience, persistence, and the ability to work under pressure. Creativity is also important since programmers sometimes must develop new ways to solve problems.

Computer programming is taught at some high schools, public and private vocational schools, two- and four-year colleges, and universities. Most programmers are college graduates; others have taken data processing courses to supplement their knowledge in other fields, such as accounting.

Programmers usually specialize in either business or scientific applications. Employers using computers for scientific or engineering applications prefer college graduates with degrees in computer science, mathematics, engineering, or the physical sciences. Very few scientific organizations hire applicants with no college training. Although some employers who use computers for business applications do not require college degrees, they prefer applicants who have had college courses in data processing, accounting, and business administration. In some cases, advancement depends on further college work leading to a bachelor's degree.

Prior work experience is not essential for a job as a programmer. Beginning programmers usually go through a period of on-the-job training.

ANALYSIS OF JOB ATTRIBUTES

The number of employed programmers doubled from about 200,000 in 1974 to about 400,000 in 1978. As computer usage continues to expand, the employment of programmers is expected to grow through the mid-1980's. Since most programmers are relatively young, few openings will result from death or retirement. However, several thousand openings will be created by workers who leave the occupation or are promoted to systems analyst positions.

Most programmers work in pleasant conditions since the machines require an atmosphere which is dust-free and in which the temperature is constant. Programmers usually work about 40 hours a week; however, since computer centers often operate around the clock, their hours are not always from 9 to 5.

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE COMPUTER PROGRAMMER

D.O.T. 020.168-005,020.188-026

COMPETENCY:

The learner will be able to analyze programming problems.

TASK:

1. Define the parameters for a problem. (IPA)
2. Determine variables to be used in a problem. (IPA)
3. Determine formulas and calculations needed in a problem. (IPA)
4. Create and interpret decision tables. (IPA)
5. Design I/O record layouts. (IPL)
6. Determine tape or disk I/O blocking factors. (ID)
7. Examine existing utility programs from program library for application to a job. (IPL)
8. Examine existing subroutines for application to a job. (IPL)
9. Select the most efficient method for a job. (IPA)
10. Estimate the time to solve a problem.
11. Select the appropriate computer language for the problem solution. (IPL)
12. Use a data base.

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE COMPUTER PROGRAMMER

D.O.T. 020.168-005,020.188-026

COMPETENCY:

The learner will be able to construct flowcharts (or pseudocode).

TASK:

1. Determine the logical sequence of a problem. (PCD, IPA, IF)
2. Use standard flowchart symbols. (PCD, IF)
3. Follow standard flowcharting guidelines for clarity and readability. (IF)
4. Prepare user-oriented flowchart for developing the program. (IF, ID)
5. Prepare programmer-oriented flowchart for coding the program. (IF, ID)
6. Desk-check the logical validity of the flowchart. (IF)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE COMPUTER PROGRAMMER

D.O.T. 020.168-005,020.188-026

COMPETENCY:

The learner will be able to code and test a computer program.

TASK:

1. Follow in-house programming guidelines and standards for format and technique. (AES)
2. Select appropriate data names. (IPL)
3. Code the logic sequence from a programmer-oriented flowchart. (IPL)
4. Code subroutines or examine existing subroutines for job application. (IPL)
5. Code parameters for use with existing utility program. (IPL)
6. Utilize previously developed programs. (PM)
7. Code error check routines. (IPL)
8. Key program code using appropriate device. (IPL)
9. Desk-check the accuracy of the program listing prior to compilation. (IPL)
10. Develop and follow a comprehensive test plan for a program. (IPL)
11. Use technical references. (IF, IPL, CO)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE COMPUTER PROGRAMMER

D.O.T. 020.168-005,020.188-026

COMPETENCY:

The learner will be able to document programs/program packages.

TASK:

1. Develop program job control statements. (ID)
2. Prepare computer operator's instructions. (ID)
3. Write documentation narrative describing the overall purpose of the program. (ID, SS)
4. Describe I/O files or data structures in a program. (ID)
5. Describe the formulas used for calculations. (ID)
6. Describe the function of each subroutine used. (ID)
7. Describe the function of each utility program used. (ID)
8. Assist in developing a user's manual. (SS)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE COMPUTER PROGRAMMER

D.O.T. 020.168-005,020.188-026

COMPETENCY:

The learner will be able to perform program maintenance functions.

TASK:

1. Update programs to meet changing requirements. (PM)
2. Modify computer program for increased efficiency. (PM)
3. Update documentation for a modified program. (PM)
4. Review existing systems for compatibility with new technology. (AES)
5. Retest entire program when modified. (PM)
6. Retest entire system when necessary. (PM)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE COMPUTER PROGRAMMER

D.O.T. 020.168-005,020.188-025

COMPETENCY:

The learner will be able to communicate with users, peers, and supervisors.

TASK:

1. Confer with systems analyst or user on program requirements. (IPA, ID)
2. Collaborate with other programmers on common projects. (ID)
3. Confer with supervisor to resolve non-routine questions. (ID)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE COMPUTER PROGRAMMER

D.O.T. 020.168-005,020.118-026

COMPETENCY:

The learner will be able to perform programming supervisory functions.

TASK:

1. Review completed programs.
2. Advise programmers on specific problems.
3. Conduct on-the-job training.
4. Maintain program library.
5. Coordinate programming group projects.
6. Prepare a programming standards manual.
7. Coordinate system upgrading.
8. Ensure that proper security procedures are being followed.

SYSTEMS ANALYST JOB ANALYSIS

NATURE OF WORK

Systems analysts perform work concerned with analyzing scientific, engineering, business, or operational problems and formulating solutions which may be presented through diagrams, representative models, mathematical expressions, or computer programs. They work for engineering firms, manufacturing plants, government agencies, financial institutions, insurance companies, retail businesses, etc. Systems analysts may also be known as systems engineers, engineering analysts, or operations-research analysts.

Examples of the types of problems assigned systems analysts include developing more efficient inventory, billing production, or shipping methods; projecting sales forecasts, employee requirements, or returns on financial investments; calculating missile, satellite, or rocket trajectories; and analyzing better ways of processing tax revenues, election returns, employment and wage surveys, business data, and virtually thousands of other types of information.

Regardless of the projects they are assigned, systems analysts first identify the specific problem to be studied and determine the desired objectives. They then gather all information pertinent to the study and investigate present methods for handling the problem. After analyzing the gathered information, systems analysts develop logical solutions to the problems; prepare charts, diagrams, matheamtical equations, models, etc., of the proposed solutions; and test their validity under any variables which may affect the outcome. They select the best methods to accomplish the objectives, prepare specifications of the selected systems, and may be required to implement the systems, making modifications as required.

ANALYSIS OF JOB PREREQUISITES

At the high school level, a college entrance program is recommended, with all possible courses in mathematics, English, and the physical sciences. Electives in data processing and business would also be desirable.

Although it is possible for persons having exceptional reasoning skills to enter this career without a college degree, most employers prefer to hire applicants who have at least a bachelor's degree and some work experience related to the type of problems to be solved. The degree should be in computer or information science or data processing. This degree should include a background in business management and accounting for a business environment, while a background in science, mathematics or engineering is preferred to work in a scientific environment.

ANALYSIS OF JOB ATTRIBUTES

Prospective systems analysts can begin their training in many different fields since half of the persons entering this occupation have transferred from other occupations especially computer programmer. To advance toward the analysts position continued technical training is available from employers and software vendors. An indication of experience and professional competence is the Certificate of Data Processing (CDP) which can be obtained by completing five years experience and a written examination. Systems analysts can advance to managers of systems or data processing department.

Employment opportunities for systems analysts are expected to be excellent for the next five years. The bureau of Labor Statistics estimates an average of 7,600 openings for these workers each year between now and 1985. Total employment in this field should continue to expand due to the steady increase in the use of computers to process business, sicentific, and engineering data. In addition to openings resulting from growth, many systems analysts will be needed to replace present workers who are promtoed, retired, or leave the occuation for other reasons.

Most systems analysts work an average 35-to-40 hour week. However, some overtime hours may be required at times. Fringe benefits received by these workers usually include paid vacations, sick leave, health and life insurance and retirement pensions.

Systems analysts work in surroundings that usually are well-lighted, air-conditioned, and supplied with adequate equipment and reference materials to perform their work. In addition to working in offices, warehouses, laboratories, libraries, and other locations to complete their assignments.

Little physical activity is required. Systems analysts generally spend most of their day working at desks or electronic processing equipment. They attend frequent meetings and often work in cooperation with management personnel, scientists, engineers, programmers, and other professional and technical workers. At times they may be subject to stress when attempting to find solutions to difficult problems or completing assignments by scheduled deadlines.

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE SYSTEMS ANALYST

D.O.T. 003,012.167-066,020

COMPETENCY:

The learner will be able to develop system implementation procedures.

TASK:

1. Define the documentation of a system. (SS)
2. Define and sequence operations to be performed by personnel in a system. (DDS, SI)
3. Define and sequence operations to be performed by various equipment units.
4. Develop a feedback procedure for the operations. (SI)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE SYSTEMS ANALYST

D.O.T. 003,012.167-066,020

COMPETENCY:

The learner will be able to analyze existing systems.

TASK:

1. Evaluate effectiveness and limitations of existing systems. (AES)
2. Evaluate the effect of changes within a system. (AES)
3. Review existing systems as conditions change. (AES, DDS)
4. Evaluate the effect of constraints on a system. (AES)
5. Efficiently modify the system without disrupting other operating functions. (SI)
6. Evaluate a system according to accepted industry standards. (AES)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE SYSTEMS ANALYST

D.O.T. 003,012.167-06,020

COMPETENCY:

The learner will be able to analyze the organization to establish a plan for systems study.

TASK:

1. Identify the goals of the organization. (AES)
2. Identify the strategies selected by the organization to achieve goals. (DDS)
3. Identify operation tools and techniques necessary to change data into useful information. (DDS)
4. Establish priorities for analyzing existing systems. (AES)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE SYSTEMS ANALYST

D.O.T. 003,012.167-066,020

COMPETENCY:

The learner will be able to write system specifications.

TASK:

1. Develop flowcharts and diagrams. (ID)
2. Coordinate with user department to develop job specifications. (DDS)
3. Design and write systems program specifications. (SS)
4. Identify procedures for system acceptance and testing. (SI)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE SYSTEMS ANALYST

D.O.T. 003,012.167-066,020

COMPETENCY:

The learner will be able to design and develop new systems.

TASK:

1. Develop a system to improve production or workflow. (DDS)
2. Plan and develop the implementation of the system. (SI)
3. Recommend changes in hardware and/or software. (AES)
4. Evaluate the effectiveness of the new system. (AES)

BUSINESS and OFFICE OCCUPATIONS

INSTRUCTIONAL PROGRAM DATA PROCESSING

JOB TITLE SYSTEMS ANALYST

D.O.T. 003,012.167-066,020

COMPETENCY:

The learner will be able to communicate with personnel at all levels and in several fields.

TASK:

1. Use technical language of various fields. (DDS)
2. Prepare and present nontechnical reports, memoranda, systems documentation, etc. (AES)
3. Develop and train systems analysts, projects leaders, and user personnel. (SI)
4. Interact with personnel to discuss problems relating to human relations. (DDS)

STUDENT ACHIEVEMENT REPORT

STUDENT NAME ______________________ HIGH SCHOOL ______________________
STUDENT ADDRESS ______________________ POSTSECONDARY SCHOOLS ______________
SOCIAL SECURITY NO. __________________ ______________________________
OCCUPATIONAL PROGRAM ________________ O. E. CODE ______________________

UNITS	ASSIGNMENTS					JOBS		PRE/POST TEST		TEACHER'S INITIALS
Data Processing Concepts & Functions	1									
Historical Development of Data Processing										
Common Features of Data Processing Systems	1									
Programming Concepts & Documentation	1									
Data Processing Applications & Careers	1	2								
Offline Data Entry Devices						1	2			
Online Computer Terminal						1	2			
Data Entry Formats						1	2			
Computer Operations	1					1				
Preparing Jobs for Execution	1					1				
Data Control Functions	1					1				
Operations & Maintenance of Peripheral Equipment	1					1				

(Continued on Next Page)

UNITS	ASSIGNMENTS					JOBS		PRE/POST TEST		TEACHER'S INITIALS
Data Support Functions										
Supervision of Data Processing Functions										
Introduction to Problem Analysis	1	2	3							
Introduction of Flowcharting	1	2	3	4						
Introduction to Programming Languages	1	2	3	4						
Introduction to Documentation	1	2	3							
Program Maintenance	1	2	3	4	5					
Analyzing Existing Systems										
Systems Specification										
Design & Develop Systems										
System Implementation										

DATA PROCESSING UNITS

BDP	Basic Data Processing Concepts and Functions
HDP	Historical Development of Data Processing
CFD	Common Features of Data Processing System
PCD	Programming Concepts and Documentation
DPAC	Data Processing Applications and Careers
ODED	Offline Data Entry Devices
OCT	Online Computer Terminal
DEF	Data Entry Formats
CO	Computer Operation
PJE	Preparing Jobs for Execution
DCF	Data Control Functions
OMPE	Operations and Maintenance of Peripheral Equipment
DSF	Data Support Functions
SDPF	Supervision of Data Processing Functions
IPA	Introduction to Problem Analysis
IF	Introduction to Flowcharting
IPL	Introduction to Programming Languages
ID	Introduction to Documentation
PM	Program Maintenance
AES	Analyzing Existing Systems
SS	Systems Specifications
DDS	Design and Develop Systems
SI	System Implementation

PREREQUISITES TO DATA PROCESSING UNITS

	BDP	HDP	CFD	PCD	DPAC	ODED	OCT	DEF	CO	PJE	DCF	OMPE	DSF	SDPF	IPA	IF	IPL	ID	PM	AES	SS	DDS	SI
BDP																							
HDP																							
CFD																							
PCD																							
DPAC																							
ODED	X	0	X		0																		
OCT	X	0	X		0																		
DEF	X	0	X		0	X	X																
CO	X	0	X		0	X	X																
PJE	X	0	X		0	X	X		X														
DCF	X	0	X		0	X	X		X														
OMPE			X																				
DSF	X	0	X		0	X	X		X	X	X	X											
SDPF	X	0	X		0	X	X	X	X	X		X	X										
IPA	X	0	X		0																		
IF	X	0	X	X	0										X								
IPL	X	0	X	X	0										X	X							
ID	X	0	X	X	0										X	X	X						
PM	X	0	X	X	0										X	X	X	X					
AES	X	0	X	X	0										X	X	X	X	X				
SS	X	0	X	X	0													X		X			
DDS	X	0	X	X	0										X	X	X	X	X	X	X		
SI	X	0	X	X	0										X	X	X	X	X	X	X	X	

0 = optional

DATA PROCESSING CONCEPTS
MINI-UNIT I

BASIC DATA PROCESSING CONCEPTS AND FUNCTIONS

MINI-UNIT OBJECTIVE

After completion of this mini-unit, the student should be familiar with basic data processing concepts and functions. This knowledge will be evidenced through completion of assignments and by scoring 90% on the mini-unit test.

SPECIFIC OBJECTIVES

After completion of this mini-unit, the student should be able to:

1. Match terms related to basic data processing concepts and functions to their correct definitions.
2. Match the various data processing operations to their correct definitions.
3. Describe four methods of data processing.
4. Match the parts of a punch card to their correct descriptions.
5. Observe various pieces of punch card equipment in use.
6. List the advantages of electromechanical data processing.
7. List the advantages of electronic data processing.

BASIC DATA PROCESSING CONCEPTS
MINI-UNIT I

BASIC DATA PROCESSING CONCEPT AND FUNCTIONS

SUGGESTED ACTIVITIES

I. Instructor:

  A. Give pretest.

  B. Provide student with objective sheet.

  C. Provide student with information and assignment sheets.

  D. Make transparencies.

  E. Discuss unit and specific objectives.

  F. Discuss information and assignment sheets.

  G. Give test.

II. Student:

  A. Take pretest.

  B. Read objective sheet.

  C. Study information sheets.

  D. Complete assignment sheet.

  E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet.

  B. Information sheets.

  C. Transparency masters: TM 1 - The Punch Card.

  TM 2 - Punch Card with Numeric Data.

TM 3 - Alphabetic Code.

TM 4 - Punch Card with Alphabetic Data.

TM 5 - Punch Card with Alphabetic and Numeric Data.

TM 6 - Punch Card with Alphabetic and Numeric Data and Special Characters.

E. Assignment sheets: #1 - Identifying Data Processing.

#2 - Interpreting Data Operations.

#3 - Punching a Card.

#4 - Punching Personal Information.

F. Answers to assignment sheets.

G. Pretest and test.

H. Answers to pretest and test.

II. References

A. DeRossi, Claude J. Exploring the World of Data Processing. Reston, Virginia: Reston Publishing Company, Inc., 1975.

B. Squire, Enid. The Computer: An Everyday Machine. Canada: Addison-Wesley Ltd., 1972.

C. Wu, Margaret S. Introduction to Computer Data Processing, second edition. New York: Harcourt Brace Jovanovich, Inc., 1979.

D. References available in your school.

BASIC DATA PROCESSING CONCEPTS
MINI-UNIT I

BASIC DATA PROCESSING CONCEPTS AND FUNCTIONS

PRETEST

1. Match the terms on the right to their correct definition.

_____a. The manipulation of factual matter of all kinds for the purpose of producing a desired answer or result.

_____b. A high-speed digital electronic calculating device which has provision for internal storage of program and data.

_____c. An original document from which basic data is extracted.

_____d. A representation of facts, concepts, or instructions in a formalized manner, suitable for communication, interpretation and processing by humans or machines.

_____e. A record in which all data concerning each item in a transaction is punched into a separate card.

_____f. A storage medium in which data is represented by means of holes punched in vertical columns into a paper card.

_____g. The knowledge that grows out of data when it has been processed.

1. Computer
2. Data
3. Data processing
4. Information
5. Punch card
6. Source document
7. Unit record

2. Match the various data processing operations on the right to the correct definition.

_____a. The procedure of writing, rewriting, and reproducing data by hand or by machine.

_____b. The systematic assigning or coding of similar data into categories accoridng to established rules.

_____c. The orderly filing of information so that it may be used when it is needed.

1. Calculating
2. Classifying
3. Communicating
4. Recording
5. Sorting

_____d. The procedure of converting the processed data into a concise, usable form.

_____e. The process of separating data into similar groups.

_____f. The process of computing in order to arrive at a mathematical result.

_____g. The process of transmitting information to the point of use.

6. Storing

7. Summarizing

3. Describe four methods of data processing.

   a. Manual-

   b. Mechanical-

   c. Electromechanical-

   d. Electronic-

4. Match the components of a punch card on the right to their correct descriptions.

_____a. A punch in the 0, 11th, or 12th row of a punch card.

_____b. One of the horizontal lines of punching positions on a punch card.

_____c. Information is represented by the combination of a zone and a digit punch in the same card column.

_____d. The top edge of a card.

_____e. A column or group of columns in a punch card allocated for punching a particular category of data.

_____f. A punch in the 1 through 9 locations of a punch card.

_____g. One of the vertical lines of punching positions on a punch card.

1. Alphabetic code
2. Card column
3. Card face
4. Card row
5. Digit punch
6. Field
7. 9-edge
8. Numeric code
9. 12-edge
10. Visual identification

_____h. Cut corner and color.

_____i. The pre-printed side of a punch card or the side with interpretation.

_____j. Information recorded on a card by punching a single hole in a card column.

_____k. The bottom edge of a card.

11. Zone punch

5. Match the various pieces of punch card equipment on the right to their functions.

_____a. Used to check the correctness of a set of punch cards.

_____b. A device that prints on a punch card data already punched on the card.

_____c. Used to sort punch cards into the desired sequence.

_____d. Used to record data from source documents into punch cards.

_____e. Used to punch data into cards at a speed of 100 cards per minute from data which has been previously punched.

_____f. Used to add, subtract, multiply, and divide data and punch the answer into the same card or another card.

_____g. Used to merge and match the punch card files.

_____h. Used to prepare printed documents from punch cards.

1. Accounting machine
2. Calculator
3. Card punch
4. Card verifieer
5. Collator
6. Interpreter
7. Reproducer
8. Sorter

6. List 4 advantages of electromechanical data processing.

a.

b.

c.

d.

7. List 4 advantages of electronic data processing (EDP).

   a.

   b.

   c.

   d.

BASIC DATA PROCESSING CONCEPTS
MINI-UNIT I

BASIC DATA PROCESSING CONCEPTS AND FUNCTIONS

INFORMATION SHEET

I. Terms and definitions

   A. Computer--A high-speed digital electronic calculating device which has provision for internal storage of program and data.

   B. Data--A representation of facts, concepts, or instructions in a formalized manner, suitable for communication, interpretation and processing by humans or machines.

   C. Data processing--The manipulation of factual matter of all kinds for the purpose of producing a desired answer or result.

   D. Information--The knowledge that grows out of data when it has been processed.

   E. Punch card--A storage medium in which data is represented by means of holes punched in vertical columns into a paper card.

   F. Source document--An original document from which basic data is extracted.

   G. Unit record--A record in which all data concerning each item in a transaction is punched into a separate card.

II. Data processing operations

   A. Calculating--The process of computing in order to arrive at a mathematical result.

   B. Classifying--The systematic assigning or coding of similar data into categories according to established rules.

   C. Communicating--The process of transmitting information to the point of use.

   D. Recording--The process of writing, rewriting, and reproducing data by hand or by machine.

   E. Sorting--The process of separating data into similar groups.

   F. Storing--The orderly filing of information so that it may be used when it is needed.

   G. Summarizing--The procedure of converting the processed data into a concise, usable form.

III. Methods of data processing

A. Electromechanical data processing--Requires data to be in a machine-readable form, usually punch cards. Because punch card equipment is automatic, it eliminates much of the human effort.

B. Electronic data processing (EDP)--This method of data processing involves processing by computer. Like electromechanical, it requires data to be in a machine-readable form; however, this method can process data much faster.

C. Manual data processing--To complete by hand all the operations in the data processing cycle.

D. Mechanical data processing--Involves the use of typewriters, adding machines, accounting machines, etc. A group of these mechanical devices may form a data processing system.

IV. Punch card parts (TM 1, TM 2, TM 3, TM 4, TM 5, TM 6)

A. Alphabetic code--The letters of the alphabet are represented by the combination of a zone and a digit punch in the same card column.

B. Card column--One of the vertical lines of punching positions on a punch card.

C. Card face--The pre-printed side of a punch card or the side with interpretation.

D. Card row--One of the horizontal lines of punching positions on a punch card.

E. Digit punch--A punch in the 1 through 9 locations of a punch card when recording alphabetic data. Rows 0 through 9 are digit rows when recording numeric data.

F. Field--A column or group of columns in a punch card allocated for punching a particular category of data.

G. 9-Edge--The bottom edge of a card.

H. Numeric code--Numeric information is recorded on a card by punching a single hole in a card column. This hole is punched in the numbered row that is the same number as the digit to be recorded.

I. 12-Edge--The top edge of a card.

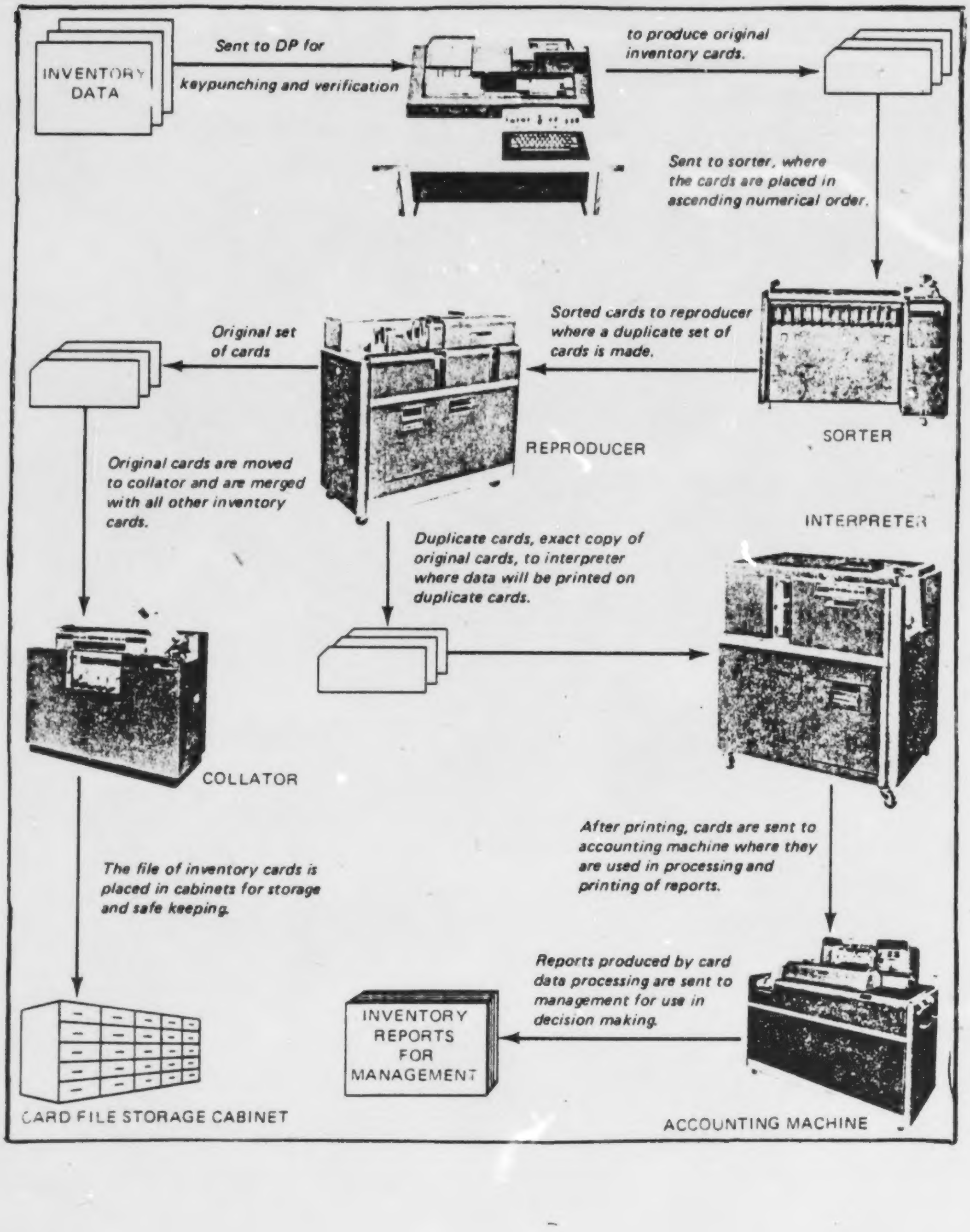
J. Visual identification of cards--Cut corner and color.

K. Zone punch--A punch in the 11th or 12th row of a punch card when recording alphabetic data.

V. Punch card equipment

- A. Card punch & Verifier--Used to record data from source documents into punch cards and to check the correctness of a set of punch cards.
- B. Sorter--Used to sort punch cards into the desired sequence.
- C. Collator--Used to merge and match the punch; can also selcet, sequence,check, and file of cards.
- D. Interpreter--A device that prints on a punch card data already punched in the card.
- E. Calculator--Used to add, subtract, multiply, and divide data and punch the answer into the same card or another card.
- F. Accounting machine also called calculator-printers--Used to prepare printed documents from punch cards.
- G. Reproducer--Used to punch data into cards at a speed of 100 cards per minute from data which had been previously punched.

H. Flow of data using card punch equipment.


INVENTORY DATA
Sent to DP for
keypunching and verification
to produce original inventory cards.
Sent to sorter, where the cards are placed in ascending numerical order.
Sorted cards to reproducer where a duplicate set of cards is made.
SORTER
Original set of cards
REPRODUCER
Original cards are moved to collator and are merged with all other inventory cards.
Duplicate cards, exact copy of original cards, to interpreter where data will be printed on duplicate cards.
INTERPRETER
COLLATOR
After printing, cards are sent to accounting machine where they are used in processing and printing of reports.
The file of inventory cards is placed in cabinets for storage and safe keeping.
Reports produced by card data processing are sent to management for use in decision making.
INVENTORY REPORTS FOR MANAGEMENT
CARD FILE STORAGE CABINET
ACCOUNTING MACHINE

VI. Advantages of electromechanical data processing

A. As an input medium, the card is versatile, durable and permanent. The information may be used repeatedly.

B. The card can accommodate printed or written matter, and thus may be used as a check, an invoice, or some other business paper.

C. Each card contains all the information describing a single transaction. All similar transactions can be grouped and processed together.

D. The card represents data that can be processed by a wide variety of automatic data processing machines.

E. The punched data in a card can be verified for accuracy before processing takes place.

VII. Advantages of electronic data processing (EDP)

A. EDP has much higher processing speeds.

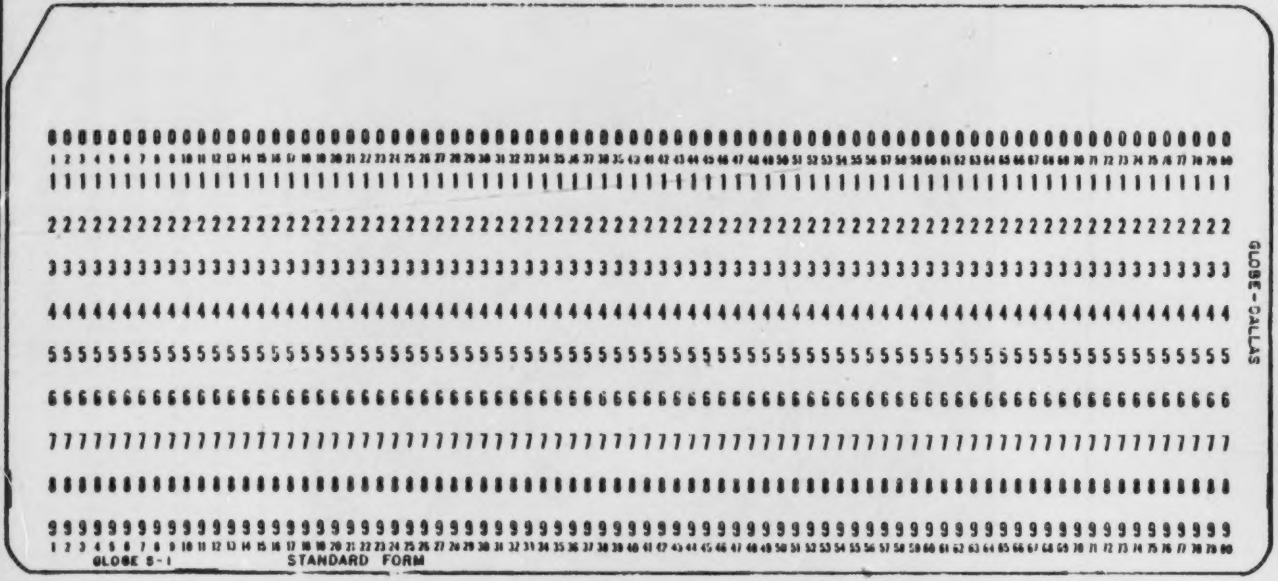
B. EDP has greater accuracy.

C. With EDP, many kinds of input and output media can be processed.

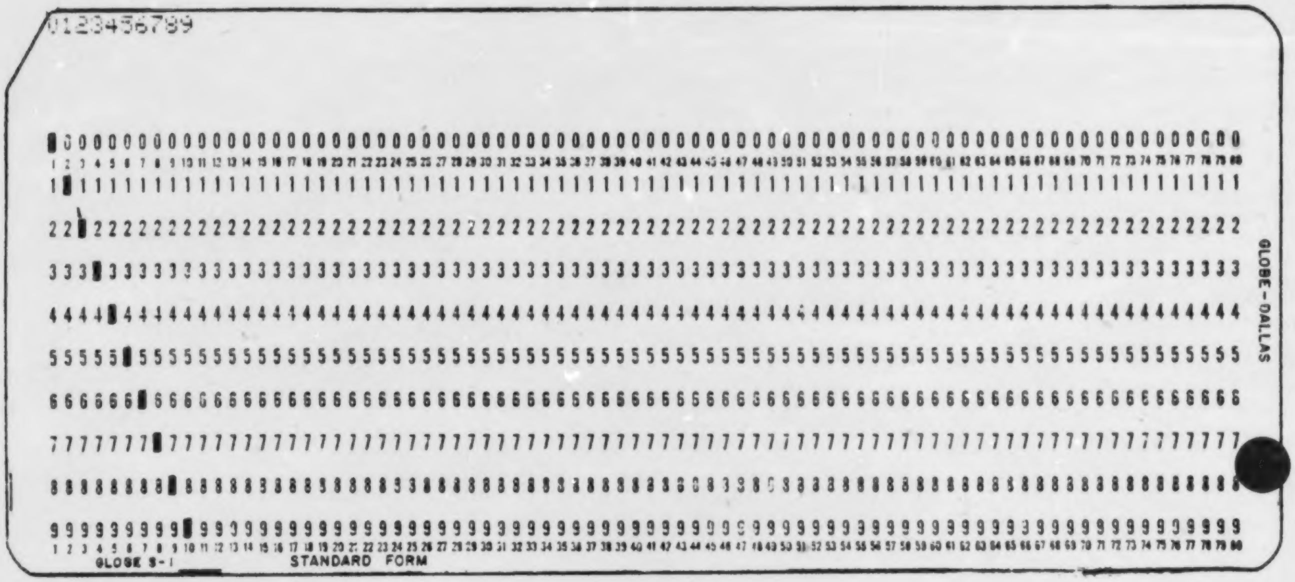
D. With EDP, instructions can be stored internally.

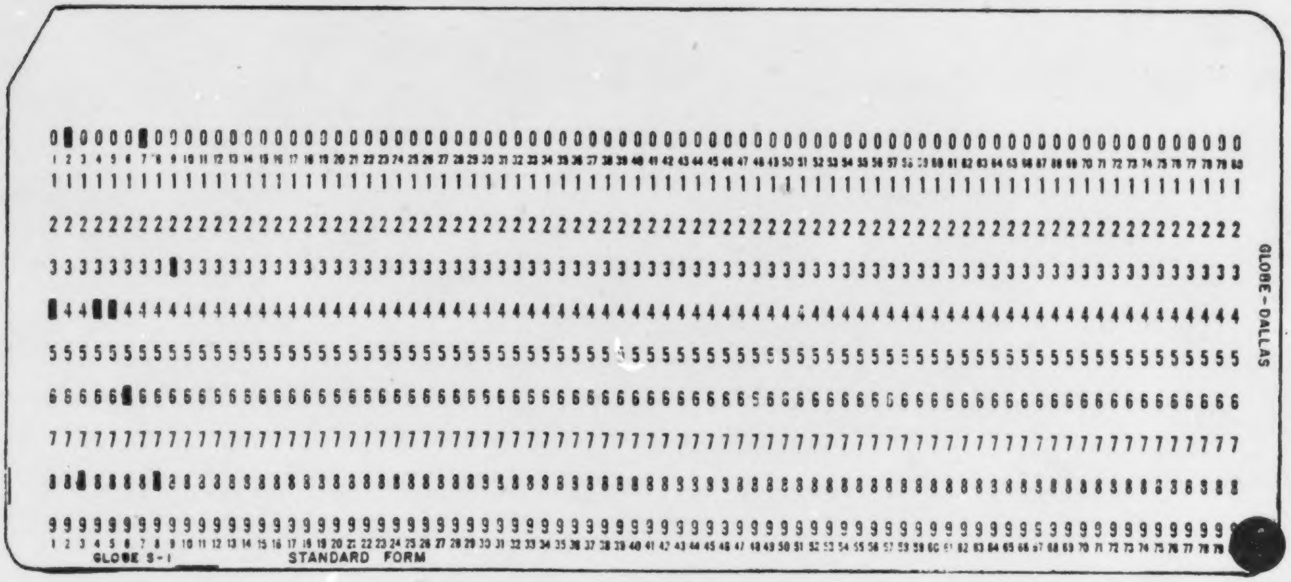
E. An EDP system can make logical decisions.

PUNCH CARD


GLOBE S-1
STANDARD FORM
GLOBE-DALLAS

PUNCH CARD WITH NUMERIC DATA


0123456789
GLOBE S-1
STANDARD FORM
GLOBE-DALLAS

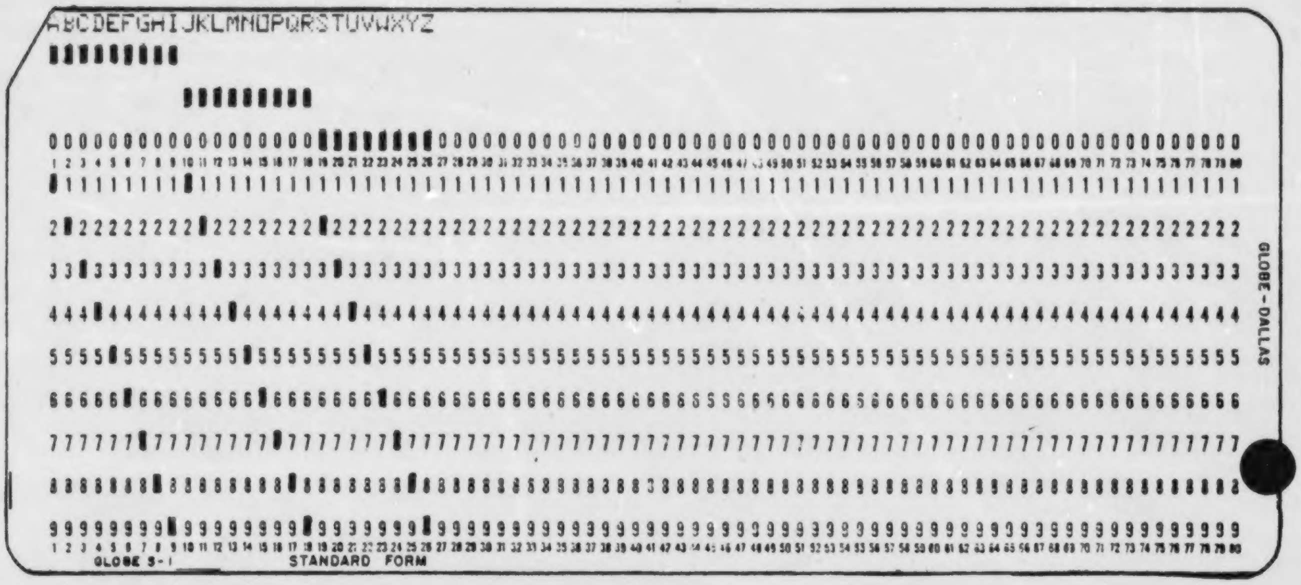

GLOBE S-1
STANDARD FORM
GLOBE-DALLAS

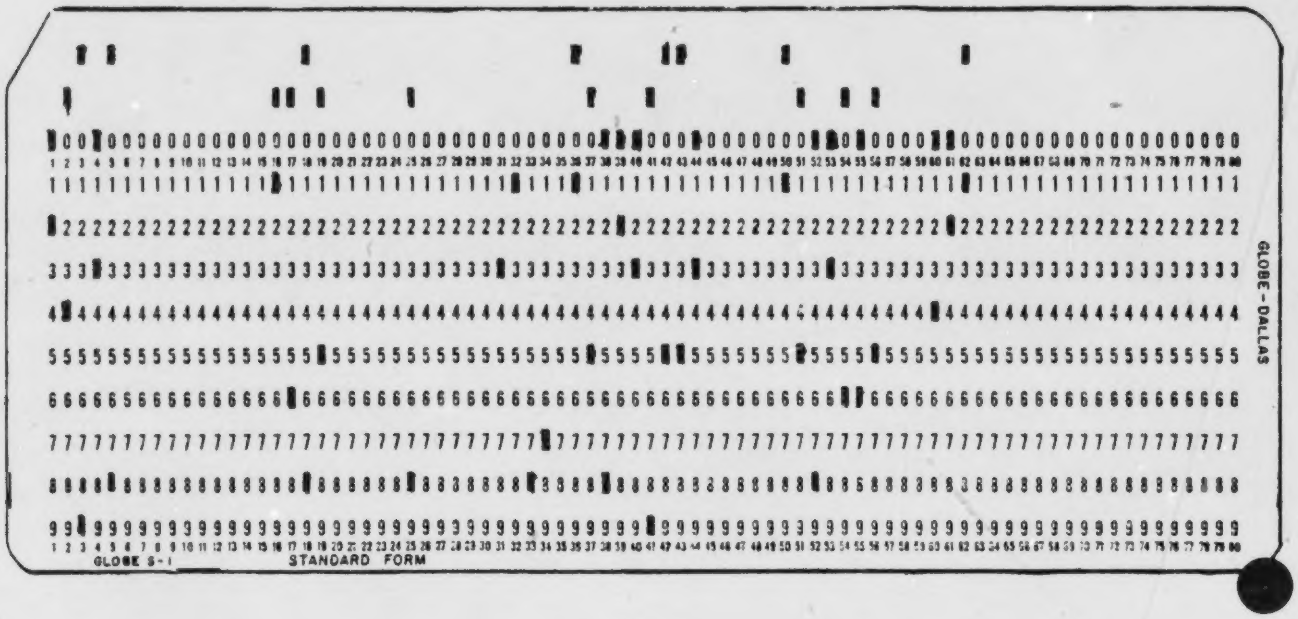
ALPHABETIC CODE

A ZONE PUNCH (12, 11, OR 0) IS COMBINED WITH ONE OF THE NUMERIC PUNCHES (1 TO 9) TO FORM THE 26 LETTERS OF THE ALPHABET. LETTERS ARE CODED AS FOLLOWS:

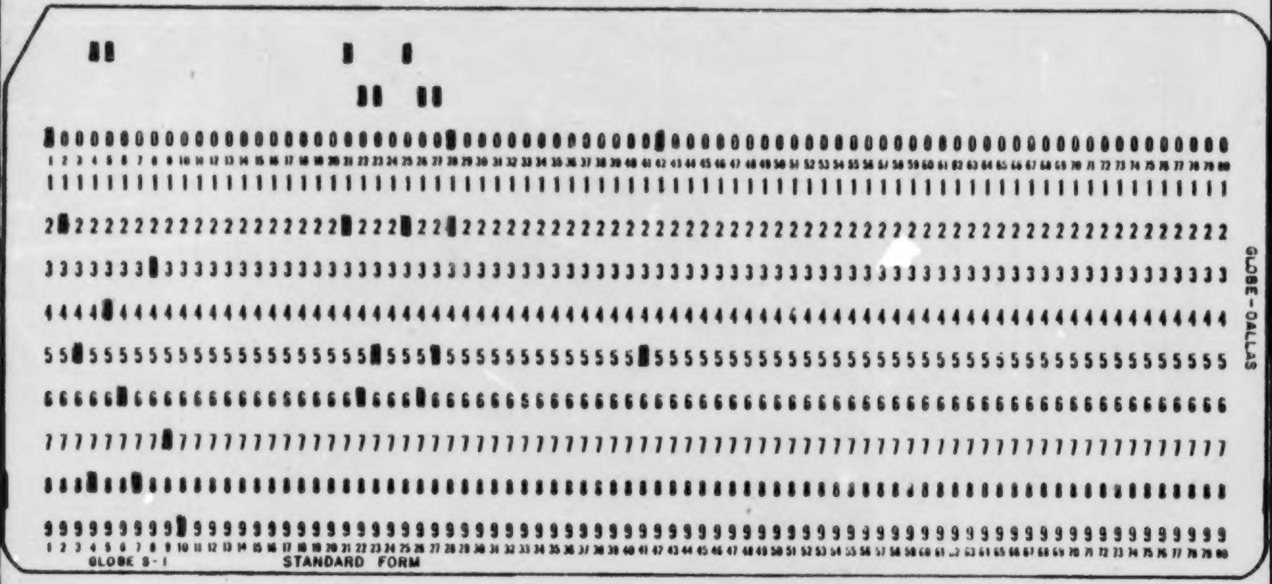
LETTER	ZONE	NUMBER
A	12 Zone	1
B		2
C		3
D		4
E		5
F		6
G		7
H		8
I		9
J	11 Zone	1
K		2
L		3
M		4
N		5
O		6
P		7
Q		8
R		9
S	0 Zone	2
T		3
U		4
V		5
W		6
X		7
Y		8
Z		9

PUNCH CARD WITH ALPHABETIC DATA

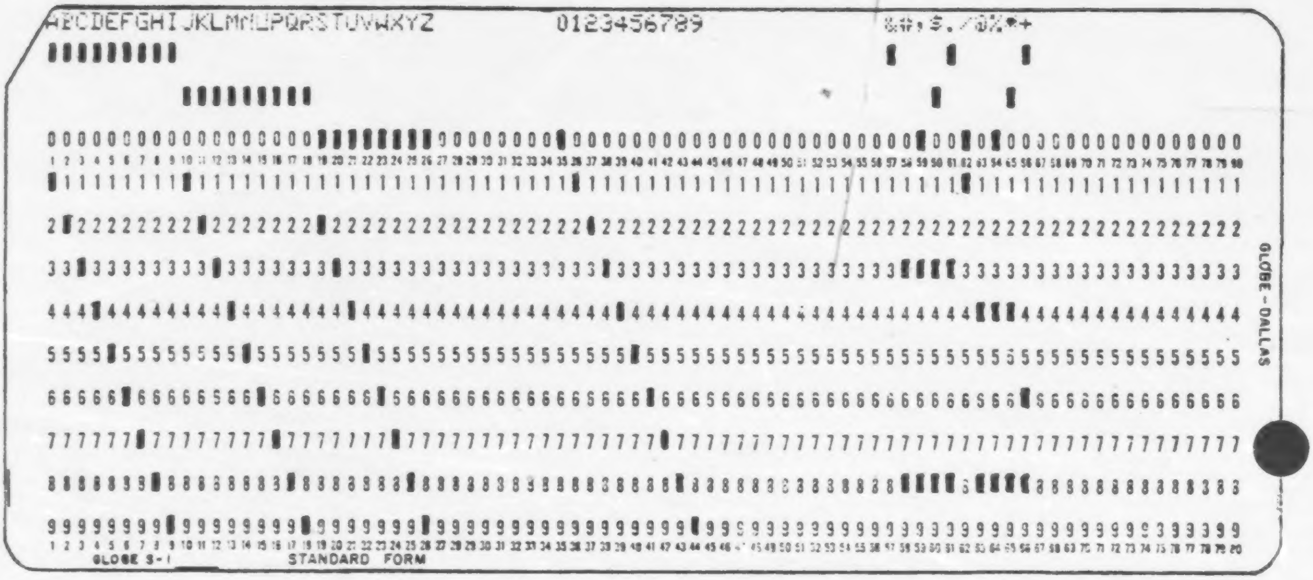

ABCDEFGHIJKLMNOPQRSTUVWXYZ
GLOBE 5-1
STANDARD FORM
GLOBE-DALLAS

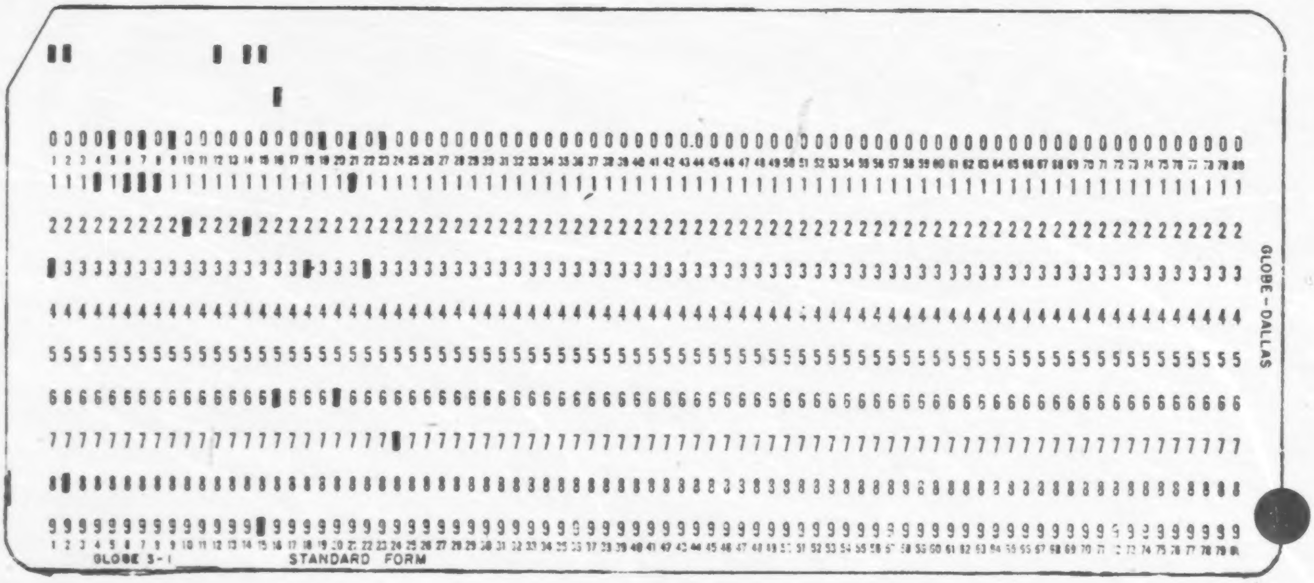

GLOBE 5-1
STANDARD FORM
GLOBE-DALLAS

PUNCH CARD WITH ALPHABETIC AND NUMERIC DATA


GLOBE S-1
STANDARD FORM
GLOBE-DALLAS

PUNCH CARD WITH ALPHABETIC AND NUMERIC DATA AND SPECIAL CHARACTERS


ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789
&#,$./@%*+
GLOBE S-1
STANDARD FORM
GLOBE-DALLAS


GLOBE S-1
STANDARD FORM
GLOBE-DALLAS

BASIC DATA PROCESSING CONCEPTS
MINI-UNIT I

BASIC DATA PROCESSING CONCEPTS AND FUNCTIONS

ASSIGNMENT SHEET #1--IDENTIFYING DATA PROCESSING OPERATIONS

Using your Information Sheet, part II, identify the operation or operations in each of the following activities:

ACTIVITY OPERATION/S

1. Writing a letter ____________________
2. Counting your change when you make a purchase ____________________
3. Putting your books in your locker ____________________
4. Filling in the blanks on an application form ____________________
5. Reorganizing your class notes according to subjects ____________________
6. Designating by a number each of the states in the United States ____________________
7. Figuring the cost of an item ____________________
8. Giving an application form to a secretary ____________________
9. Memorizing your friend's phone number ____________________
10. Replying verbally to a friend who has inquired about the time of day ____________________
11. Converting processed data into a concise, usable form ____________________
12. Bringing into balance your allowance and expenditures for the week ____________________
13. Separating the report cards for boys and girls ____________________
14. Preparing a list of your friend's names ____________________

ACTIVITY	OPERATION/S
15. Calling the library to inquire about a book	
16. Taking a photograph of a map	
17. Assigning numbers to customers' names on invoices	
18. Putting your personal items in your dresser	
19. Sending a birthday card to a friend	
20. Figuring the grade averages for your report card	

BASIC DATA PROCESSING CONCEPTS
MINI-UNIT I

BASIC DATA PROCESSING CONCEPTS AND FUNCTIONS

ASSIGNMENT SHEET #2--INTERPRETING DATA

Using the transparency masters as references, interpret the data punched on the cards.

TM - 2 ____

TM - 4 ____

TM - 5 ____

TM - 6 ____

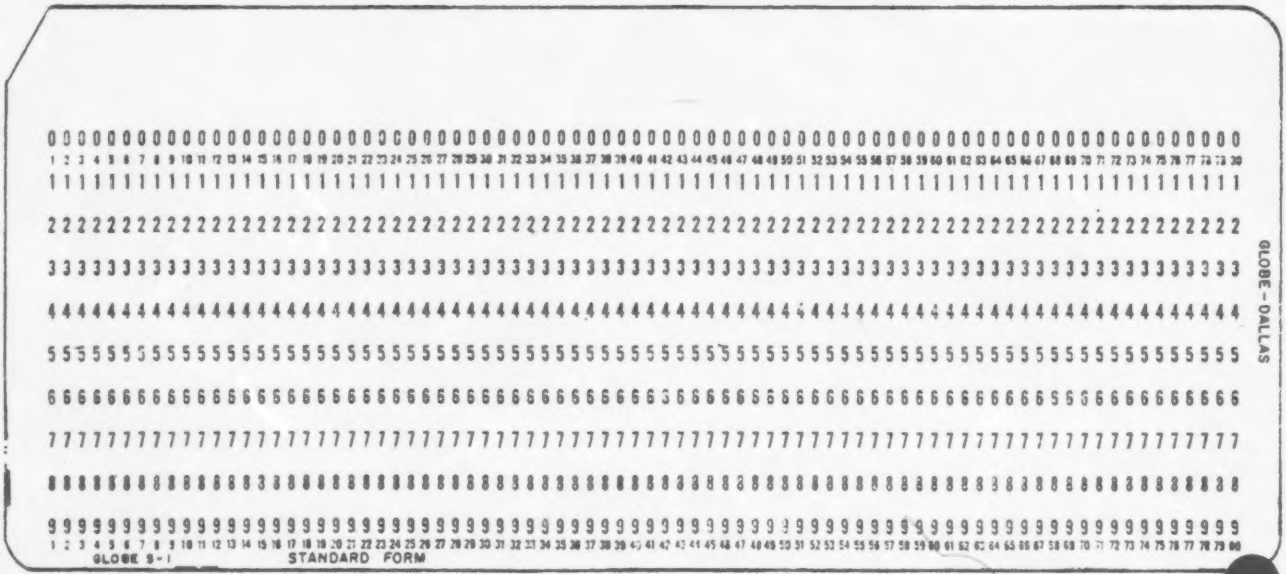
BASIC DATA PROCESSING CONCEPTS
MINI-UNIT I

BASIC DATA PROCESSING CONCEPTS AND FUNCTIONS

ASSIGNMENT SHEET #3--PUNCHING A CARD

Using the picture of the card below, darken the punches necessary to record the following data:

Columns	Record
1 - 10	John Doe
20 - 30	500 Elm
40 - 50	Memphis TN
60 - 70	38111


GLOBE S-1
STANDARD FORM
GLOBE-DALLAS

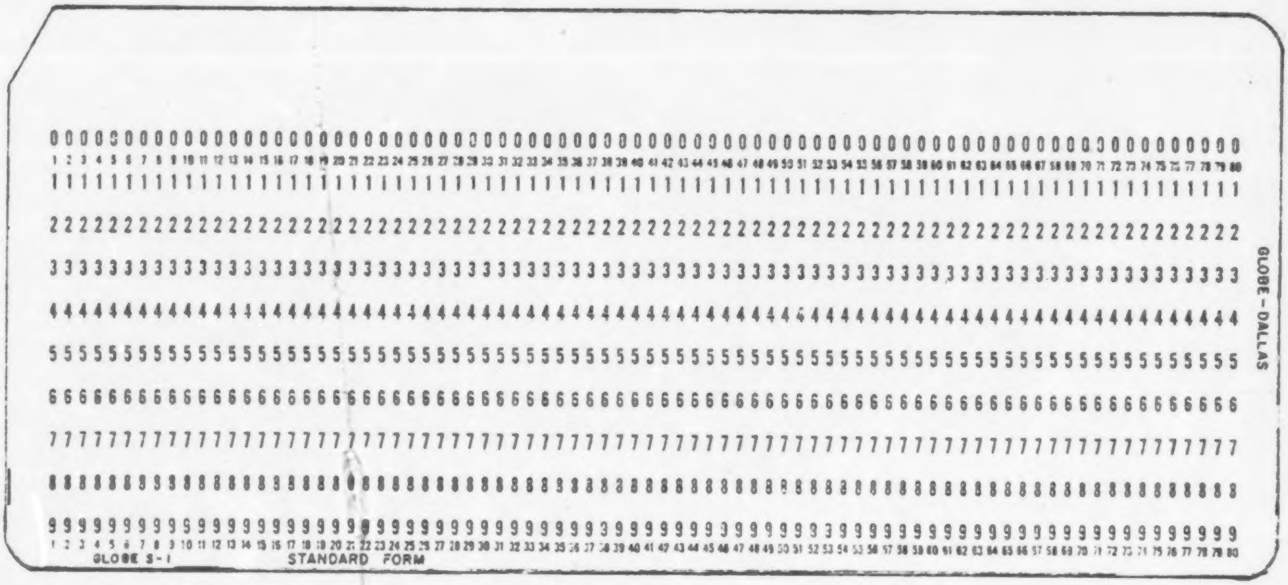
BASIC DATA PROCESSING CONCEPTS
MINI-UNIT I

BASIC DATA PROCESSING CONCEPTS AND FUNCTIONS

ASSIGNMENT SHEET #4--PUNCHING PERSONAL INFORMATION

Using the picture of the card below, darken the punches necessary to record the following data:

Column	Record
1 - 20	Your last name
25 - 50	The name of the town in which you live
55 - 70	Your area code and phone number



BASIC DATA PROCESSING CONCEPTS
MINI-UNIT I

BASIC DATA PROCESSING CONCEPTS AND FUNCTIONS

ANSWERS TO ASSIGNMENT SHEETS

ASSIGNMENT SHEET #1

1. Recording
2. Calculating
3. Storing
4. Recording
5. Sorting
6. Classifying
7. Calculating
8. Communicating
9. Storing
10. Communicating
11. Summarizing
12. Calculating
    Summarizing
13. Sorting
14. Recording
15. Communicating
16. Recording
17. Classifying
18. Storing
19. Communicating
20. Calculating
    Summarizing

ASSIGNMENT SHEET #2:

TM - 2 40844083

TM - 4 SMITH JOHN Q 3137 ANY STREET ANY TOWN USA

TM - 5 025H068379 BON BONS 50

TM - 6 CH 101/102 & BIO 306/307

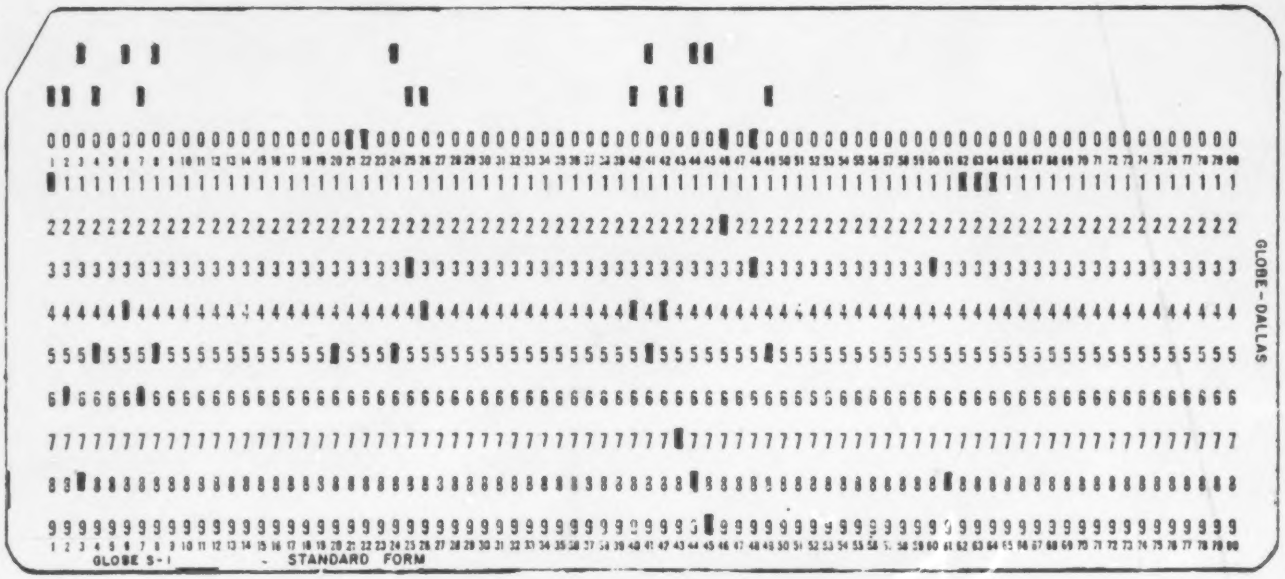
BASIC DATA PROCESSING CONCEPTS
MINI-UNIT I

BASIC DATA PROCESSING CONCEPTS AND FUNCTIONS

ANSWER TO ASSIGNMENT SHEETS

ASSIGNMENT SHEET #3:

John Doe 500 Elm Memphis TN 38111


GLOBE S-1
STANDARD FORM
GLOBE-DALLAS

ASSIGNMENT SHEET #4: Answers will depend on student's input.

DATA PROCESSING CONCEPTS
MINI-UNIT I

BASIC DATA PROCESSING CONCEPTS AND FUNCTIONS

TEST

I. MULTIPLE CHOICE: Given the description of a data processing function, circle the number of the term that best relates to the function.

a. The process of converting the processed data into a concise, usable form.

    1. Sorting
    2. Storing
    3. Summarizing
    4. Recording

b. The orderly filing of information so that it may be used when it is needed.

    1. Storing
    2. Communicating
    3. Calculating
    4. Classifying

c. The systematic assigning of similar data into categories according to established rules.

    1. Recording
    2. Summarizing
    3. Storing
    4. Classifying

d. The process of transmitting information to the point of use.

    1. Calculating
    2. Communicating
    3. Classifying
    4. Recording

e. The process of writing, rewriting, and reproducing data by hand or by machine.

    1. Recording
    2. Sorting
    3. Summarizing
    4. Communicating

f. The process of separating data into similar groups.

1. Classifying
2. Sorting
3. Storing
4. Calculating

g. The process of computing in order to arrive at a mathematical result.

1. Recording
2. Calculating
3. Communicating
4. Summarizing

2. TRUE STATEMENTS: Circle the letter of each statement which is true.

a. EDP has much higher processing speeds.

b. Each card contains all the information describing a single transaction. All similar transactions can be grouped and processed together.

c. With EDP, instructions can be stored externally.

d. EDP has greater accuracy.

e. The punched data in a card can be verified for accuracy while processing takes place.

f. As an input medium, the card is versatile, durable and permanent. The information may be used repeatedly.

g. The card can accommodate printed or written matter, and thus may be used as a check, an invoice, or some other business paper.

h. With EDP, only certain types of symbols can be processed.

i. An EDP system can make logical decisions.

j. The card represents data that can be processed by a minimum of data processing machines.

3. MATCHING: Match the methods of data processing on the right to their definition.

_____a. Requires data to be in a machine-readable form.

_____b. To complete by hand all operations.

_____c. Involves the use of typewriters, adding machines, accounting machines, etc.

_____d. Processing machine-readable data by computer.

1. Electromechanical processing
2. Electronic data
3. Manual data processing
4. Mechanical data processing

4. TRUE OR FALSE: Using "T" or "F", indicate if the following statements are true or false.

_____a. A sorter is used to print information on a card.

_____b. An original document from which basic data is extracted is called a source document.

_____c. A high-speed digital electronic calculating device which has provision for internal storage of program and data is known as a computer.

_____d. An interpreter prints out information that is stored on a punch card.

_____e. A unit record is a record in which all data concerning each item in a transaction is punched into a separate card.

_____f. A collector merges and matches the punch card files.

_____g. A calculator adds, subtracts, multiplies, and divides data and punches the answer into a card.

_____h. Raw figures and facts to which meaning may or may not have been ascribed is known as data.

_____i. Information is processed data.

_____j. An accounting machine is used to prepare printed documents from punch cards.

_____k. A reproducer checks for the correctness of a set of punch cards.

_____l. The manipulation of factual matter of all kinds for the purpose of producing a desired answer or result is known as data processing.

_____m. A card punch is used to record data, and a verifier checks the correctness of the recorded data.

_____n. A punch card is a storage medium.

5. MATCHING: Match the components of a punch card on the right to their correct description.

_____a. One of the horizontal lines of punching positions on a punch card.

_____b. This information is recorded on a card by punching a single hole in a card column.

1. Alphabetic code
2. Card column
3. Card face
4. Card row

_____c. This information is represented by the combination of a zone and a digit punch in the same card column.

_____d. A punch in the 1 through 9 locations of a punch card.

_____e. A column or group of columns in a punch card allocated for punching a particular category of data.

_____f. One of the vertical lines of punching positions on a punch card.

_____g. A punch in the 11th or 12th row of a punch card.

_____h. The pre-printed side of a punch card or the side with interpretation.

5. Digit punch
6. Field
7. Numeric code
8. Zone punch

BASIC DATA PROCESSING CONCEPTS
MINI-UNIT I

BASIC DATA PROCESSING CONCEPTS AND FUNCTIONS

ANSWERS TO PRETEST

1. a. 3
   b. 1
   c. 6
   d. 2
   e. 7
   f. 5

2. a. 4
   b. 2
   c. 6
   d. 7
   e. 5
   f. 1

3. Answers should be similar to the following.

   a. Manual--To complete by hand all the operations in the data processing cycle.

   b. Mechanical--Involves the use of typewriter, adding machines, accounting machines, etc. A group of these mechanical devices may form a data processing system.

   c. Electromechanical--Requires data to be in a machine-readable form, usually punch cards. Because punch card equipment is automatic, it eliminates much of the human effort.

   d. Electronic (EDP)--This method of data processing involves processing by computer. Like electromechanical, it requires data to be in a machine-readable form; however, this method can process data much faster.

4. a. 11
   b. 4
   c. 1
   d. 9
   e. 6
   f. 5
   g. 2
   h. 10
   i. 3
   j. 8
   k. 7

5. a. 4
   b. 6
   c. 8
   d. 3
   e. 7
   f. 2
   g. 5
   h. 1

6. Answers should include 4 of the following advantages.

   a. As an input medium, the card is versatile, durable, and permanent. The information may be used repeatedly.

   b. The card can accommodate printed or written matter, and thus may be used as a check, an invoice, or some other business paper.

   c. Each card contains all the information describing a single transaction. All similar transactions can be grouped and processed together.

   d. The card represents data that can be processed by a wide variety of automatic data processing machines.

   e. The punched data in a card can be verified for accuracy before processing takes place.

7. Answers should include 4 of the following advantages.

   a. EDP has much higher processing speeds.

   b. EDP has greater accuracy.

   c. With EDP, many kinds of symbols can be processed.

   d. With EDP, instructions can be stored internally.

   e. An EDP system can make logical decisions.

DATA PROCESSING CONCEPTS
MINI-UNIT I

BASIC DATA PROCESSING CONCEPTS AND FUNCTIONS

ANSWERS TO TEST

1. Multiple Choice.

a. 3
b. 1
c. 4
d. 2
e. 1
f. 2
g. 2

2. True Statements.

a. T
b. T
c. F
d. T
e. F
f. T
g. T
h. F
i. T
j. F

3. Matching.

a. 1
b. 3
c. 4
d. 2

4. True or False.

a. F
b. T
c. T
d. F
e. T
f. F
g. T
h. T
i. T
j. T
k. F
l. T
m. T
n. T

5. Matching.

a. 4
b. 7
c. 1
d. 5
e. 6
f. 2
g. 8
h. 3

DATA PROCESSING CONCEPTS
MINI-UNIT II

THE HISTORICAL DEVELOPMENT OF DATA PROCESSING

MINI-UNIT OBJECTIVE

After completion of this mini-unit, the student should be familiar with the historical development of data processing. This knowledge will be evidenced through assignments and by scoring 90% on the mini-unit test.

SPECIFIC OBJECTIVES

After completion of this mini-unit, the student should be able to:

1. Match terms related to the historical development of data processing to their correct definition.
2. Match the names of men important to the historical development of data processing to their achievements.
3. Describe the four generations of computers.
4. List an example of a computer from each of the four generations of computers.

DATA PROCESSING CONCEPTS
MINI-UNIT II

THE HISTORICAL DEVELOPMENT OF DATA PROCESSING

SUGGESTED ACTIVITIES

I. Instructor:

  A. Give pretest.

  B. Provide student with objective sheet.

  C. Provide student with information and assignment sheets.

  D. Discuss unit and specific objectives.

  E. Discuss information sheets.

  F. Show and discuss filmstrip listed in references (optional).

  G. Show students pictures of early calculating devices and computers (if available).

  H. Give test.

II. Student:

  A. Take pretest.

  B. Read objectives.

  C. Study information sheets.

  D. Complete assignment sheet.

  E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet.

  B. Information sheets.

  C. Assignment sheet #1 - Famous Data Processing People.

D. Answers to assignment sheet.

E. Pretest and test.

F. Answers to pretest and test.

II. References

A. Awad, Elias M. Business Data Processing, 5th edition. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1980.

B. DeRossi, Claude J. Exploring the World of Data Processing. Reston, Virginia: Reston Publishing Company, Inc., 1975.

C. ____"How Computers Work", (filmstrip/cassete set), Encyclopedia Britannica, Corp., 1972. Filmstrip #6 - "The History of the Computer".

D. Squire, Enid. The Computer: An Everyday Machine. Canada: Addison- Wesley Ltd., 1972.

E. Wu, Margaret S. Introduction to Computer Data Processing, second edition. New York: Harcourt Brace Jovanovich, Inc., 1979.

F. References available in your school.

HDP 4

DATA PROCESSING CONCEPTS
MINI-UNIT II

THE HISTORICAL DEVELOPMENT OF DATA PROCESSING

PRETEST

1. Match the terms on the right to their correct definition:

_____a. A type of mechanical switch used in computers before 1940.

_____b. A computer that performs operations by counting.

_____c. Allows step-by-step directions for computations to be stored within the computer and computations progress without need for external guidance.

_____d. A manual analog calculating computer device which was developed in the early 1600's and is still in use today.

_____e. An electrical switch which could be turned on and off in about a millionth of a second.

_____f. The complete set of instructions to the computer which are necessary to solve the problem.

_____g. A digital computing device developed by the Chinese.

_____h. Complete electronic circuits manufactured in and upon a single piece of semiconductor material.

_____i. The exponent that indicates the power to which a number is raised to produce a given number.

_____j. A computer that performs operations by measurement and simulation of nature.

1. Abacus
2. Analog computer
3. Digital computer
4. Hybrid computer
5. Integrated circuits
6. Internally stored program
7. Iron relay
8. Large scale integration
9. Logarithm
10. Program
11. Slide rule
12. Stonehenge
13. Transitor
14. Vacuum tube

_____k. A method of constructing electronic circuits in which many thousands of circuits can be stored on a single 1/4" square chip.

_____l. An electronic device consisting of a small block of semiconductor that has at least three electrodes.

_____m. Combines the most desirable features of analog and digital computers.

_____n. An astronomical observatory built by megalethic man, which could accurately predict eclipses and other important lunar events.

2. Match the names of the men on the right to their achievement in the historical development of data processing.

_____a. Developed a large analog computer called the "Differential Analyzer".

_____b. In 1671, drew the plans for the first calculator that could multiply and divide.

_____c. Invented a manual calculator called the slide rule around 1632.

_____d. In 1939, with the support of IBM, developed a large-scale digital computer called Automatic Sequence Controlled Calculator.

_____e. Patented a 20-column punching machine based on the simultaneous punching method which permitted correction before punching.

_____f. Invented logarithms and a calculating device in 1617.

_____g. Developed a set of machines which used punch cards to record data.

_____h. In 1822, conceived and built a machine called the "Difference Engine".

_____i. Developed the idea of the internally stored program and integrated it into MANIC in 1952.

1. Howard Aiken
2. Charles Babbage
3. George Boole
4. William Burroughs
5. Vannevar Bush
6. J. Presper Eckert
7. Herman Hollerith
8. Joseph Jacquard
9. John Napier
10. Jay R. Monroe
11. William Oughtred
12. Blaise Pascal
13. James Powers
14. Gottfried Von Liebnitz
15. John Von Newman

_____j. Originated the idea of punch cards in 1801.

_____k. Around 1642, invented a gear-driven machine to count long columns of figures.

_____l. In 1946, with the aid of John W. Mauchly, developed the ENIAC.

_____m. Developed a new mathematics in 1854 that could be used to analyze the logical nature and constitution of the human mind.

_____n. Invented the keyboard calculator in 1911.

_____o. In 1892, invented the first adding machine to print totals.

3. Describe the four generations of computers.

   a. First

   b. Second

   c. Third

   d. Fourth

4. List an example of a computer in each of the four generations of computers.

   a. First

   b. Second

   c. Third

   d. Fourth

DATA PROCESSING CONCEPTS
MINI-UNIT II

THE HISTORICAL DEVELOPMENT OF DATA PROCESSING

INFORMATION SHEET

1. Terms and definitions

    A. Abacus--A digital computing device developed by the Chinese. It counts by the use of sliding beads and is a biquinary device.

    B. Analog computer--A computer which performs its operations by measuring; for example, a slide rule is an analog-type computer. Analog computers derive all their data from some form of measurement (feet, degrees, volts, etc.). The accuracy of the data used by this type of computer is directly related to the precision with which the measurements are made.

    C. Digital computer--A computer which represents data as numbers; performs its operations by counting. An adding machine is an example of a digital computer. This type of computer can accurately represent data using as many positions and numbers as necessary.

    D. Hybrid computer--This computer combines the most desirable features of analog and digital computers. Possesses the speed of an analog computer and the accuracy of a digital computer. Hybrid computers are normally applied to specialized problems and are used in computer-controlled manufacturing processes and production facilities.

    E. Integrated circuits--Complete electronic circuits manufactured in and upon a single piece of semiconductor material. It replaced the transistor in computers.

    F. Internally stored program--Allows step-by-step directions for computation, called instructions, to be stored within the computer, and computations progress without need for external guidance.

    G. Iron relay--A type of mechanical switch used in early computers (before 1940). Relays were switches that could be opened or closed by electrical current passing through a magnetic coil. The Mark I weighed 5 tons and contained 3304 electromechanical relays.

    H. Large scale integration (LSI)--A method of constructing electronic circuits in which many thousands of circuits can be stored on a single chip of silicon; hense, the name "magnetic chip". Each chip is approximately 1/4" square capable of storing over 70,000 transistors.

I. Logarithm--The exponent that indicates the power to which a number is raised to produce a given number. These can be used to simplify complicated calculations.

J. Program--The complete set of instructions to the computer which are necessary to solve the problem.

K. Slide rule--A manual analog calculating device which was developed in the early 1600's and is still in use today.

L. Stonehenge--An astronomical observatory built by megalethic man, which could accurately predict eclipses and other important lunar events.

M. Transistor--An electronic device consisting of a small block of semiconductor that has at least three electrodes. This replaced the vacuum tube in computers.

N. Vacuum tube--An electrical switch which could be turned on and off in about a millionth of a second. This replaced the iron relay in computers.

II. Important men in the historical development of data processing

A. Aiken, Howard--In 1939, with the support of IBM, he developed a large-scale digital computer called Automatic Sequence Controlled Calculator. The first model was known as the Mark I and could make decisions between alternative calculational routes.

B. Babbage, Charles--In 1822, he conceived and built a machine called the "Difference Engine" which was similar to today's desk calculators, accurate to six places. He also conceived of, but was unable to build, a machine called the "Analytical Engine" which had the flexibility of a modern electronic computer and would control itself by punch cards.

C. Boole, George--An English mathematician who published a book in 1854 proposing that his new mathematics could be used to analyze the logical nature and constitution of the human mind. His form of mathematical expression is closely akin to the form of the alegebraic expression we encounter in high school algebra. Boolean algebra (developed in 1854) involves the use of OR, AND for logical addition and multiplication instead of +, X for the familiar case.

D. Burroughs, William--Invented one of the first adding machines to print totals in 1892. Most of the machines developed after this machine incorporated printed totals.

E. Bush, Vannevar--He developed a large analog computer called the "Differential Analyzer" during World War II, which generated artillery firing tables.

F. Eckert, Dr. J. Presper--In 1946, with the aid of Joch W. Mauchly, developed the ENIAC (Electronic Numerical Integrator and Calculator) which made use of the vacuum tube rather than the relay. It was the first of the electronic digital computers.

G. Hollerith, Herman--He developed a set of machines which used punch cards to record data. Hollerith convinced the government to use these in the census of 1890. This was really the first use of punch card data processing.

H. Jacquard, Joseph--In 1801, he originated the idea of punch cards. He used them in a mechanical loom in which they controlled the pattern-weaving apparatus.

I. Monroe, Jay R.--Invented the keyboard calculator in 1911.

J. Napier, John--In 1617, he invented logarithms and a calculating device called "Napier's Bones".

K. Oughtred, William--He invented a manual calculator called the slide rule around 1632.

L. Pascal, Blaise--Around 1642, he invented a gear-driven machine to count long columns of figures.

M. Powers, James--He worked with Hollerith on the census of 1890. He also patented a 20-column punching machine based on the simultaneous punching method which permitted correction before punching.

N. Von Liebnitz, Gottfied--In 1671, he drew the plans for the first calculator that could multiply and divide. It was later developed in 1694.

O. Von Newman, Dr. John--He developed the idea of the internally stored program and integrated it into MANIC (Mathematical Analyzer, Numerical Integrator and Computer) in 1952.

III. Generations of computers

A. First generation (1951-1958)--The introduction of the UNIVAC (UNIVersal Automatic Computer) I by Remington Rand Corporation in 1951 marked the advent of the first generation of computers. Also initiating this generation were the IBM 650 and the Burroughs 220.

This generation utilized the vacuum tube as a means of storing data in memory. The addition of memory made the punch card systems and the calculators virtually obsolete. The wire board was replaced by computer programs written in a new language for processing. Computers of the first generation:

1. reduced processing time by a factor of ten,
2. were bulky and somewhat inflexible,
3. demanded strict observance of air-conditioning requirements,
4. were relatively unreliable due to electric current fluctuations and tube failure,
5. contained limited and primitive memory (main storage was made of a magnetic drum that stored approximately 16,000 characters),
6. leaned toward batch applications (the entire computer was dedicated to a specific application or a program until completed), and
7. required programs written for a specific computer (programs could not be run on another computer model).

B. Second generation (1959-1964)--Transistorized circuits formed the basis for the second generation of computers in 1959. Typical second generation computers were the IBM 1401 and 7000 series, Control Data 3600, and Burroughs 5500.

The new transistor technology made the previous generation obsolete. The large-scale computers were marked by large memory banks, by faster milli-second processing speed, and by more reliable operation. Other primary characteristics were:

1. The use of the transistor reduced the physical size of the computer.
2. Main memory capacity was improved by the use of magnetic cores. Large systems could store up to 1 million characters compared to the 16,000-character capacity of earlier computers.
3. Reliability improved through built-in error detection and correction features.
4. The transistor and magnetic core reduced the storage cost per character from $2.50 to $.85.
5. Versatility improved by accommodating multiple users to access the computer concurrently.
6. Data storage was improved through the introduction of the disc file.

7. Programs were written in symbolic language, requiring special translating programs.

8. High-level, machine-independent languages (Fortran, Cobol, and the like) began to appear.

C. Third generation (1964-1971)--Typical of the third generation computers introduced after 1964 were the IBM System 360, the Honeywell 200, the RCA Spectra 70 series, and National Cash Register Century series. The transistor was replaced by solid state technology and monolithic integrated circuits. Among the main features of third generation computers are the following:

1. Operating systems handled several jobs at the same time.

2. Time sharing systems emerged. Several users could use the computer facility at the same time.

3. Standardization developed among different computer models and on applications-oriented languages (Cobol, Fortran, and the rest).

4. While computational output per dollar was increased, main memory costs dropped to approximately $.25 per character.

5. Minicomputers increased in popularity and provided a vehicle for redistributing computer power to the user, when needed.

6. A wide range of input-output and direct-access devices (such as disk storage) sprang up, including special magnetic-ink readers and graph plotters.

7. Reliability and processing speed were improved. Internal computer errors were rare. The nanosecond speed became a reality.

D. Fourth generation (1971-?)--In 1971, a new line of controversial fourth generation computers was introduced. Typical computers are the IBM 370, Burroughs 700, and Honeywell 6000 series. Regardless of their brand name, their general features can be summarized as follows:

1. The miniaturization of circuits reduced hundreds of them to the size of a pinhead.

2. Breakdown diagnosis and error detection techniques increased.

3. Multiprogramming increased. Multiprogramming is the concurrent execution of two or more programs by a computer.

4. The CPU can operate in more than one mode to improve the system's overall performance.

5. Main memory cost was further reduced to $.05 per character.

6. Improvements in operating systems made virtual storage possible. This feature allows secondary storage devices (discs, tapes, and the like) to be treated as an expanded part of the computer's main memory, such that it gives the virtual appearance of one macromemory unit.

7. The implementation of special software for managing data bases gave rise to what is called "data base management systems".

DATA PROCESSING CONCEPTS
MINI-UNIT II

THE HISTORICAL DEVELOPMENT OF DATA PROCESSING

ASSIGNMENT SHEET #1

FAMOUS DATA PROCESSING PEOPLE

V	W	S	J	A	V	E	J	A	C	Q	U	A	R	D	J	O	S	E	P	H	T
H	I	B	A	K	T	R	M	E	G	L	F	F	U	D	O	N	J	A	M	E	M
T	L	T	E	S	G	U	G	T	R	W	E	Y	C	I	H	H	E	R	M	A	N
O	L	Y	O	A	X	B	U	I	N	N	O	F	H	E	N	O	S	J	F	I	S
M	I	D	D	R	A	W	O	H	N	E	K	I	A	D	V	L	E	A	R	O	C
J	A	M	E	S	P	O	W	E	R	S	L	E	R	Z	O	L	J	Y	F	B	E
A	M	B	U	R	R	O	U	G	H	S	U	X	L	U	N	E	W	M	A	N	K
J	O	H	N	N	A	P	I	E	R	M	E	S	E	L	N	R	A	O	C	K	W
O	U	P	T	E	V	R	E	C	A	P	P	U	S	K	H	I	O	N	G	A	B
H	G	B	O	O	L	E	G	E	O	R	G	E	B	N	I	T	Z	O	E	E	J
L	H	E	E	N	Z	O	U	Z	H	N	S	E	A	B	O	H	X	R	Q	U	H
T	T	U	O	R	V	A	N	N	E	V	A	R	B	U	S	H	S	E	F	N	R
L	R	I	A	M	K	E	O	R	O	S	A	Q	B	H	C	W	U	J	V	E	E
I	E	M	L	L	A	C	S	A	P	E	S	I	A	L	B	O	O	A	M	F	F
N	D	V	O	N	L	I	E	B	N	I	T	Z	G	O	T	T	F	R	I	E	D
E	N	E	D	R	J	P	R	E	S	P	E	R	E	C	K	E	R	T	S	Q	U

DIRECTIONS:

Find these famous data processing people. Names may be listed horizontally, vertically, backwards, and at right angles. Circle the name of the individual. The first answer has been done for you.

1. Developed a large-scale digital computer.

2. Originated the idea of punch cards.

3. Developed ENIAC.
4. Patented a 20-column punching machine.
5. Developed idea of internally stored programs.
6. Invented a gear-driven counting machine.
7. Developed first calculator.
8. Built "Difference Engine".
9. Invented logarithms.
10. Developed a set of machines which used punch cards to record data.
11. Invented a manual calculator.
12. Developed the "Differential Analyzer".
13. Invented the keyboard calculator.
14. An English mathematician.
15. Invented the first adding machine to print totals.

DATA PROCESSING CONCEPTS
MINI-UNIT II

THE HISTORICAL DEVELOPMENT OF DATA PROCESSING

ANSWER SHEET TO ASSIGNMENT SHEET #1

FAMOUS DATA PROCESSING PEOPLE

```
  W           J A C Q U A R D J O S E P H
  I                             O
  L                       C   H H E R M A N
  L                       H   N O   J
  I   D R A W O H N E K I A I V L   A
J A M E S P O W E R S     R   O L   Y
  M B U R R O U G H S     L   N E W M A N
J O H N N A P I E R       E     R   O
  U                       S     I   N
  G B O O L E G E O R G E B     T
  H                       A     H   R
  T       V A N N E V A R B U S H   E
  R                       B
  E     L A C S A P E S I A L B
  D V O N L I E B N I T Z G O T T F R I E D
      D R J P R E S P E R E C K E R T
```

DATA PROCESSING CONCEPTS
MINI-UNIT II

THE HISTORICAL DEVELOPMENT OF DATA PROCESSING

TEST

1. TRUE STATEMENTS: Circle the letter of the statements that are true.

   a. First generation computers employed vacuum tubes.

   b. Third generation computers are much more expensive than previous generations.

   c. An IBM 1401 is an example of a second generation computer.

   d. Third generation computers can handle larger volume of data than previous generations.

   e. Fourth generation computers are able to diagnose breakdowns and detect errors.

   f. IBM System/360 employ integrated circuits.

   g. An example of a first generation computer is the UNIVAC.

   h. Third generation computers are more reliable, faster, and larger than previous generations.

   i. Second generation computers employ transistors.

   j. The third generation of computers employ terminals that can be used by almost anyone.

2. MULTIPLE CHOICE: Circle the number of the correct answer.

   a. The __?__ computer is normally applied to specialized problems.

      1. analog
      2. digital
      3. hybrid
      4. none of the above

   b. A manual analog calculating device still in use is called a

      1. program.
      2. slide rule.
      3. logarithm.
      4. none of the above.

c. A computer that performs operations by measurement and simulation of nature is the

   1. analog computer.
   2. transistor.
   3. digital computer.
   4. none of the above.

d. A ? is the complete set of instructions to the computer which are necessary to solve a problem.

   1. logarithm
   2. program
   3. internally stored program
   4. none of the above

e. The astronomical observatory built by megalethic man is called

   1. iron relay.
   2. biquinary.
   3. Stonehenge.
   4. none of the above.

f. An electrical switch which could be turned on and off in about a millionth of a second is called the

   1. iron relay.
   2. vacuum tube.
   3. integrated circuits.
   4. none of the above.

g. The ? computer performs operations by counting.

   1. analog
   2. abacus
   3. biquinary
   4. none of the above

h. An electronic device consisting of a small block of a semiconductor that has at least three electrodes is known as a/an

   1. transistor.
   2. logarithm.
   3. integrated circuit.
   4. none of the above.

i. A/An ? allows instructions to be stored within the computer.

   1. program
   2. biquinary
   3. internally stored program
   4. none of the above

j. A digital computing device developed by the Chinese is called a/an

   1. analog computer.
   2. logarithm.
   3. abacus.
   4. none of the above.

k. The exponent that indicates the power to which a number is raised to produce a given number is known as

1. iron relay.
2. logarithm.
3. biquinary.
4. none of the above.

l. The ___?___ is a mechanical switch used in early computers.

1. Great Brass Brain
2. Stonehenge
3. slide rule
4. none of the above

m. ___?___ replaced the transistor in computers.

1. Vacuum tubes
2. Integrated circuits
3. Iron relays
4, None of the above

3. MATCHING: Match the names of the data processing people on the right to their correct achievement.

_____a. Developed a set of machines which used punch cards to record data.

_____b. Developed the idea of the internally stored program and integrated it into his MANIC.

_____c. In 1801, originated the idea of punch cards.

_____d. Invented the keyboard calculator in 1911.

_____e. Developed a large analog computer called the "Differential Analyzer".

_____f. Patented a 20-column punching machine based on the simultaneous punching method which permitted correction before punching.

_____g. Around 1642, invented a gear-driven machine to count long columns of figures.

_____h. In 1939, with the support of IBM, developed a large-scale digital computer called Automatic Sequence Controlled Calculator.

1. Aiken, Howard
2. Babbage, Charles
3. Boole, George
4. Burroughs, William
5. Bush, Vannevar
6. Eckert, J. Presper
7. Hollerith, Herman
8. Jacquard, Joseph
9. Napier, John
10. Monore, Jay R.
11. Oughtred, William
12. Pascal, Blaise
13. Powers, James
14. Von Liebnitz, Gottfried
15. Von Newman, John

____i. Invented the first adding machine to print totals in 1892.

____j. In 1617, invented logarithms and a calculator device.

____k. In 1946, developed the ENIAC.

____l. Invented a manual calculator called the slide rule around 1632.

____m. In 1671, designed the plans for the first calculator that could multiply and divide.

____n. In 1822, conceived and built a machine called the "Difference Engine".

____o. In 1854, developed a new mathematics that could be used to analyze the logical nature and constitution of the human mind.

DATA PROCESSING CONCEPTS
MINI-UNIT II

THE HISTORICAL DEVELOPMENT OF DATA PROCESSING

ANSWERS TO PRETEST

1.	a. 7	e. 14	i. 9	m. 4
	b. 3	f. 10	j. 2	n. 12
	c. 6	g. 1	k. 8	
	d. 11	h. 5	l. 13	
2.	a. 5	e. 13	i. 15	m. 3
	b. 14	f. 9	j. 8	n. 10
	c. 11	g. 7	k. 12	o. 4
	d. 1	h. 2	l. 6	

3. Answers should be similar to the III of the Information Sheet.

4. Examples may vary.
   a. First generation--UNIVAC, IBM 650, Burroughs 220
   b. Second generation--IBM 1401 and 7000, Control Data 3600, Burroughs 5500
   c. Third generation--IBM System/360, Honeywell 200, RCA Spectra 70
   d. Fourth generation--IBM 370, Burroughs 700, Honeywell 6000

DATA PROCESSING CONCEPTS
MINI-UNIT II

THE HISTORICAL DEVELOPMENT OF DATA PROCESSING

ANSWERS TO TEST

1. True Statements.

a. T
b. F
c. F
d. T
e. T
f. T
g. T
h. F
i. T
j. T

2. Multiple Choice.

a. 3
b. 2
c. 1
d. 2
e. 3
f. 2
g. 4
h. 1
i. 3
j. 3
k. 2
l. 4
m. 2

3. Matching.

a. 7
b. 15
c. 8
d. 10
e. 5
f. 13
g. 12
h. 1
i. 4
j. 9
k. 6
l. 11
m. 14
n. 2
o. 3

DATA PROCESSING CONCEPTS
MINI-UNIT III

COMMON FEATURES OF DATA PROCESSING SYSTEMS

MINI-UNIT OBJECTIVE

After completion of this mini-unit, the student should be familiar with common features of data processing systems. This knowledge will be evidenced through completion of assignments and scoring 90% on the mini-unit test.

SPECIFIC OBJECTIVES

After completion of this mini-unit, the student should be able to:

1. Match terms related to common features of data processing systems to the correct definitions.
2. Compare the analog, digital, and hybrid computers.
3. Describe the components of a computer.
4. Describe and compare five types of memory units.
5. Match various types of input/output devices to their functions.

DATA PROCESSING CONCEPTS
MINI-UNIT III

COMMON FEATURES OF DATA PROCESSING SYSTEMS

SUGGESTED ACTIVITIES

I. Instructor:

  A. Give pretest.

  B. Provide student with objective sheet.

  C. Provide student with information and assignment sheets.

  D. Make transparencies.

  E. Discuss unit and specific objectives.

  F. Discuss information and assignment sheets.

  G. Discuss TM 1, TM 2, and TM 3.

  H. Show and discuss filmstrips listed in references.

  I. Give test.

II. Student:

  A. Take pretest.

  B. Read objectives.

  C. Study information sheets.

  D. Complete assignment sheet.

  E. Make sure you are able to identify various input/output devices.

  F. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet.

  B. Information sheets.

C. Transparency masters: #1 - Comparison of Analog, Digital, and Hybrid Computers

#2 - Components of a Computer

#3 - Comparison of Memory Units

D. Assignment sheet #1 - Analog and Digital Devices.

E. Answers to assignment sheet.

F. Pretest and test.

G. Answers to pretest and test.

II. References

A. DeRossi, Claude J. Exploring the World of Data Processing. Reston, Virginia: Reston Publishing Company, Inc., 1975.

B. _____"How Computers Work", (filmstrip/cassette set): Encyclopedia Britannica, Corp., 1972. Filmstrip #1 - "The Computer System".

C. _____"How Computers Work", (filmstrip/cassette set), Encyclopedia Britannica Corp., 1972. Filmstrip #2 - "Software and Hardware at Work".

D. _____"How Computers Work", (filmstrip/cassette set), Encyclopedia Britannica Corp., 1972. Filmstrip #3 - "Number Systems: The Computers Vocabulary".

E. Shelly, Gary B. and Thomas J Cashman. Introduction to Computers and Data Processing. Fullerton, CA: Anaheim Publishing Company, 1980.

F. Squire, Enid. The Computer: An Everyday Machine. Canada: Addison-Wesley Ltd., 1972.

G. Wu, Margaret S. Introduction to Computer Data Processing, second edition. New York: Harcourt Brace Jovanovich, Inc., 1979.

H. References available in your school.

DATA PROCESSING CONCEPTS
MINI-UNIT III

COMMON FEATURES OF DATA PROCESSING SYSTEMS

PRETEST

1. Match the terms on the right to the correct definition.

_____a. A high-speed electronic digital calculating device which has provisions for internal storage of a program and data.

_____b. Equipment not connected directly to the system.

_____c. The physical equipment or devices of a system forming a computer and its peripheral equipment.

_____d. A data processing system which permits many users to use the system at the same time.

_____e. Retrieval or storage of data by a reference to its location on a volume, rather than related to previously retrieved stored data.

_____f. An identification represented by a name, label, or number for a location in storage.

_____g. Programs stored in a nonerasable memory.

_____h. The term used to describe all programs used by the computer system.

_____i. Equipment that is directly connected to the system.

_____j. The complete set of instructions to the computer which are necessary to solve problems.

_____k. Input/output devices that are exterior to the main frame of the computer.

1. Address
2. Computer
3. Firmware
4. Hardware
5. Offline
6. Online
7. Peripheral equipment
8. Program
9. Random access
10. Software
11. Time-sharing

2. Fill in the following chart to compare the three basic types of computers.

Type of Computer	Accuracy	Speed	Cost	Flexibility	Mode of Operation
a. DIGITAL	________	_______	______	___________	_________
b. ANALOG	________	_______	______	___________	_________
c. HYBRID	________	_______	______	___________	

3. Describe the function of each component of a computer.

a. Central processing unit -

b. Input unit -

c. Arithmetic/logic unit -

d. Output unit -

e. Control unit -

4. Fill in the following chart to describe and compare the four memory units listed below.

MEMORY UNIT	BRIEF DESCRIPTION	ACCESS SPEED	PERMANENCE	CAPACITY FOR STORAGE
Magnetic Core	a.__________	______	__________	__________
Magnetic Disc or Drum	b.__________	______	__________	__________
Magnetic Tape	c.__________	______	__________	__________
Punch Cards	d.__________	______	__________	__________
Magnetic Bubble	e.__________	______	__________	__________

5. Match the input/output devices listed on the right to their correct function.

_____a. A special printing device that has the capability to print continuous line drawings, graphs, and pictorial displays of data.

_____b. A specialized input device capable of reading uppercase and lowercase alphabetic, numerical, certain special characters, and bar codes from handwritten, typed, and printed paper documents.

_____c. An electronic vacuum tube that displays output data on a screen by means of controlled electron beams.

_____d. A device used to read information punched on a paper tape prepared by keyboard devices.

_____e. A device used to record data from source documents into punch cards.

_____f. A device which transfers data to and from the computer. It is controlled by a special keyboard or by the computer.

_____g. An output device that produces a permanent hard copy in the form of character or symbols on paper or card stock.

_____h. A device used to converse with a computer and usually located in close proximity to it.

_____i. A device capable of reading the data stored in a punch card and transmitting it to the main computer storage.

1. Card punch
2. Card reader
3. Cathode ray tube
4. Console typewriter
5. Graph plotter
6. Magnetic tape unit
7. Optical character reader
8. Paper tape reader
9. Printer

DATA PROCESSING CONCEPTS
MINI-UNIT III

COMMON FEATURES OF DATA PROCESSING SYSTEMS

INFORMATION SHEET

1. Terms and definitions

   A. Address--An identification represented by a name, label, or number for a location in storage.

   B. Computer--A high-speed, electronic, digital calculating device which has provisions for internal storage of a program and data.

   C. Firmware--Programs stored in a nonerasable memory. This is often done with critical programs that are used repeatedly.

   D. Hardware--The physical equipment or devices of a system forming a computer and its peripheral equipment.

   E. Offline--Equipment not connected directly to the system.

   F. Online--Equipment that is directly connected to the system.

   G. Peripheral equipment--Input/output devices; they are referred to as peripheral because they are exterior to the main frame of the computer.

   H. Program--The complete set of instructions to the computer which are necessary to solve problems.

   I. Random access--Retrieval or storage of data by a reference to its location on a volume, rather than related to previously retrieved stored data.

   J. Software--The term used to describe all programs used by the computer system.

   K. Time-sharing--A data processing system which permits many users to use the system at the same time.

II. Types of computers (TM 1)

   A. Analog--A computer which performs its operations by measuring; for example, a slide rule is an analog-type computer. Analog computers derive all their data from some form of measurement (feet, degrees, volts, etc.). The accuracy of the data used by this type of computer is directly related to the precision with which the measurements are made.

B. Digital--A computer which represents data as numbers: performs its operations by counting. An adding machine is an example of a digital computer. This type of computer can accurately represent data using as many positions and numbers as necessary.

C. Hybrid--This computer combines the most desirable features of analog and digital computers. Possesses the speed of an analog computer and the accuracy of a digital computer. Hybrid computers are normally applied to specialized problems and are used in computer-controlled manufacturing processes and production facilities.

III. Components of a computer (TM 2)

A. Central processing unit (CPU)--The CPU is the heart of the computer system. It interprets the instructions in a computer program, performs the calculations and the moving of data as specified by the program, and controls the input/output operations of the system. The CPU is one part of the processor unit of a system; the second part being the main computer storage. Data to be processed is stored in the main computer storage and is then referenced by the CPU so that processing can occur. The CPU consists of the arithmetic/logic unit and the control unit.

B. Arithmetic/logic unit--Uses "built-in" operations to perform arithmetic operations such as addition, subtraction, multiplication, and division. It can also perform logical operations such as comparing one number to another and indicating the results of the comparison.

C. Control unit--Directs and coordinates the entire computer system which includes controlling the input/output units, controlling the operations of the arithmetic/logic unit, and transferring data to and from main computer storage.

D. Input unit--Presents data to the processor unit of the computer system for the processing of the data. This data is put on some type of media (tape, cards, disk, etc.) in machine-readable format.

E. Output unit--A device which displays prints or otherwise makes information available to people. Two popular forms of output are the printed report and the CRT terminal.

IV. Types of memory units (TM 3)

A. Magnetic core--A widely used form of internal computer storage for many years, which consist of very small, ring-shaped pieces of material which would be magnetized in one of two directions.

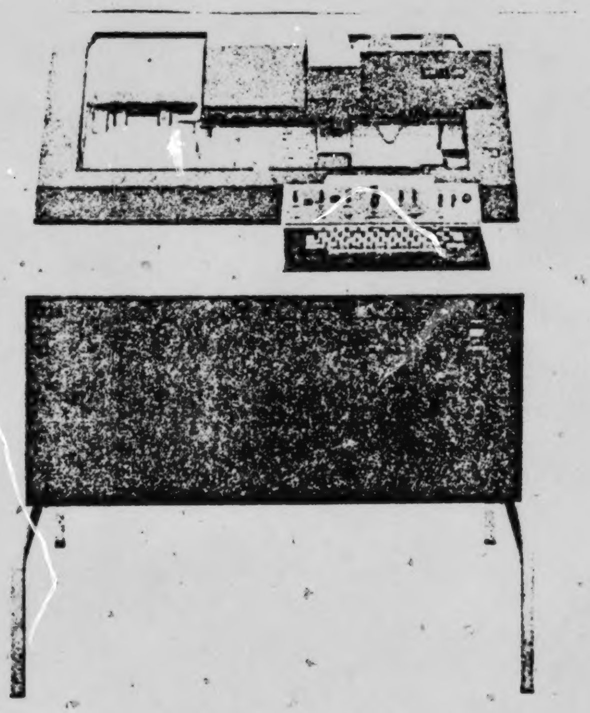
B. Magnetic drum or disc--Data is stored as magnetic spots on tracks on each surface of the disk or drum.

C. Magnetic tape--A 1/2" wide piece of mylar on which data is stored electronica-ly as magnetic spots. Typical lengths for tape are 600, 1200, and 2400 feet.

D. Punch cards--A piece of lightweight cardboard capable of storing data in the form of punched holes recorded in predefined locations.

E. Magnetic bubble--Composed of small magnetic domains (bubbles) formed on a thin single-crystal film. Bubble memory is similar to a sandwich. The filling is a chip wrapped by two coils and lies between two permanent magnetic slabs. The coils create a rotating magnetic field that moves the domains through the film of the chip. Film may consist of magnetic metals or synthetic garnet crystals.

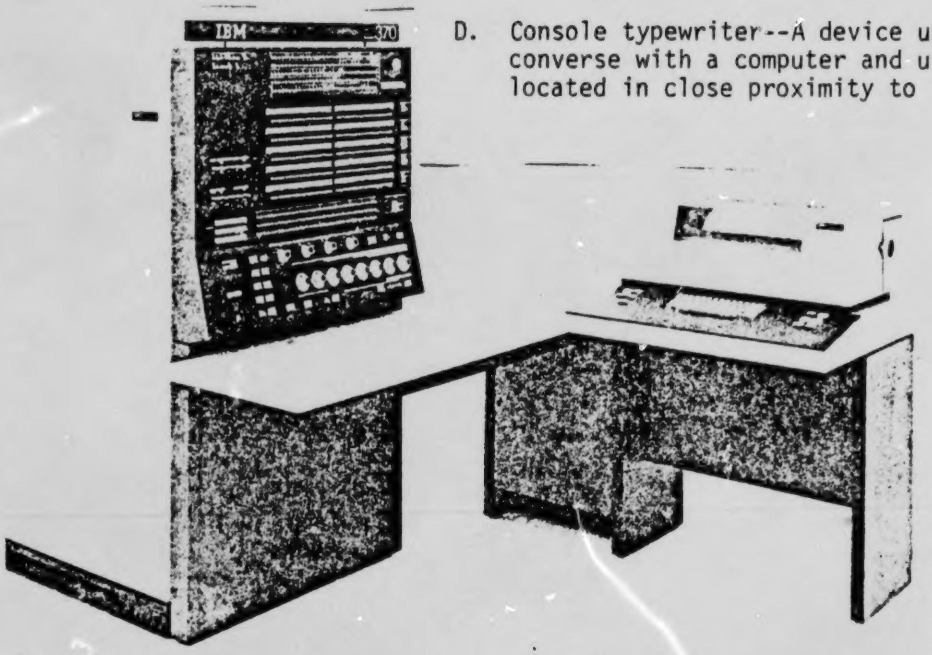
V. Examples of input and output devices and their function



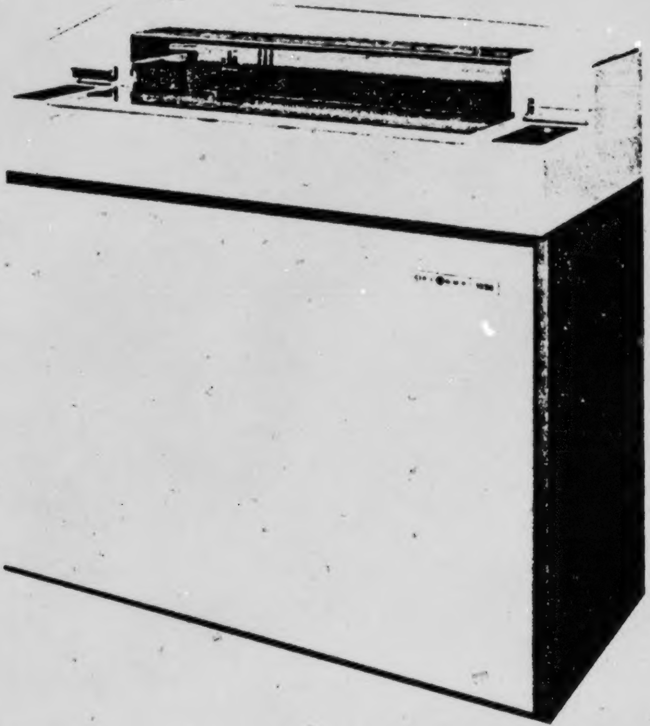
A. Card punch--A device used to record data from source documents into punch cards.

B. Card reader--A device capable of reading the data stored in a punch card and transmitting it to the main computer storage.

C. Cathode ray tube--An electronic vacuum tube that displays output data on a screen by means of controlled electron beams.



D. Console typewriter--A device used to converse with a computer and usually located in close proximity to it.

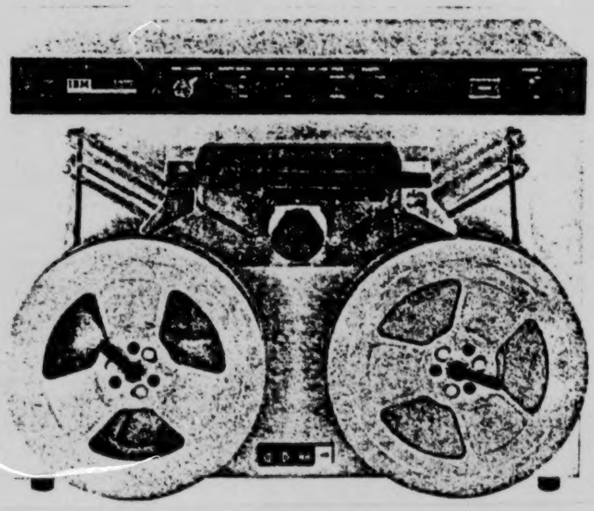


E. Graph plotter-- A special printing device that has the capability to print continuous line drawings, graphs, and pictorical displays of data.

F. Magnetic tape unit--
A device which transfers data to and from the computer. It is controlled by a special keyboard or by the computer.

G. Optical character reader--
A specialized input device capable of reading uppercase and lower case alphabetic, numeric, and certain special characters, and bar codes from handwritten, typed, and printed paper documents.

H. Paper tape reader--A device used to read information punched on a paper tape prepared by keyboard devices.

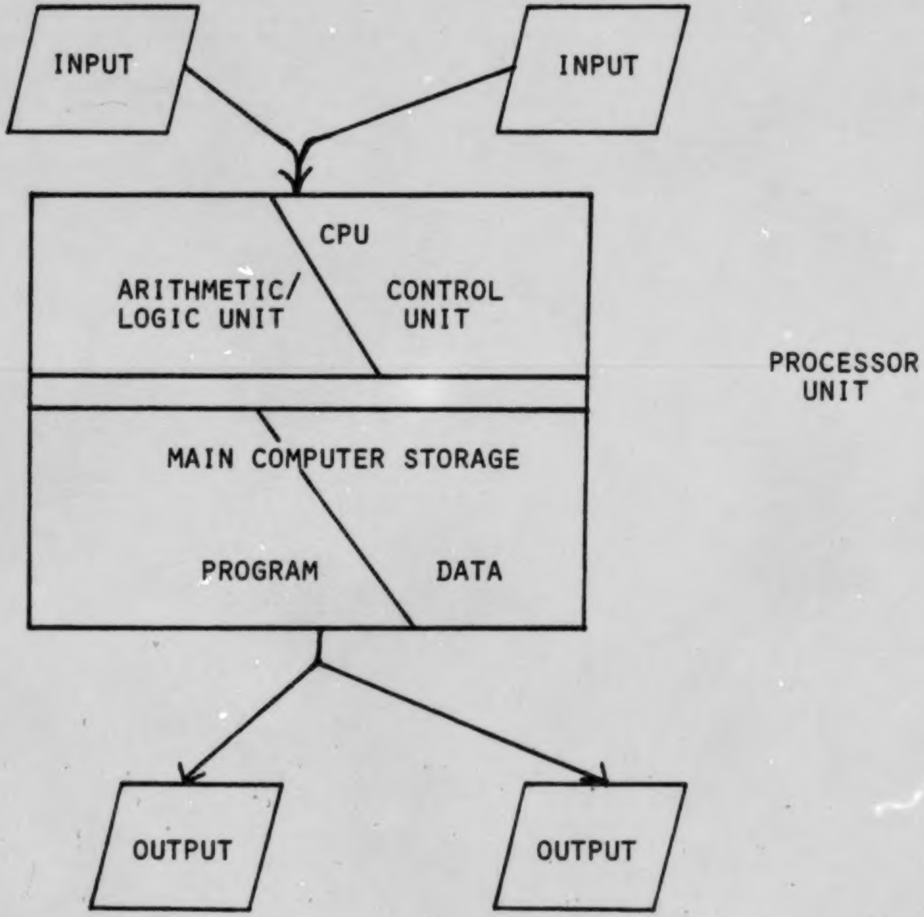


I. Printer--An output device that produces a permanent hardcopy in the form of character or symbols on paper or card stock.

COMPARISON OF ANALOG, DIGITAL, AND HYBRID COMPUTERS

CHARACTERISTIC	ANALOG COMPUTERS	DIGITAL COMPUTERS	HYBRID
ACCURACY	HIGH	LOW	HIGH
SPEED	FAST	VERY FAST	VERY FAST
COST	LOW	LOW	LOW
FLEXIBILITY	EXCELLENT	LIMITED	UNLIMITED (USED FOR SPECIALIZED PROBLEMS)
MODE OF OPERATIONS	COUNTING OF DISCRETE PULSES	MEASURES AND SIMULATES NATURE	

COMPONENTS OF A COMPUTER


INPUT
INPUT
CPU
ARITHMETIC/
LOGIC UNIT
CONTROL
UNIT
PROCESSOR
UNIT
MAIN COMPUTER STORAGE
PROGRAM
DATA
OUTPUT
OUTPUT

COMPARISON OF MEMORY UNITS

MEMORY UNIT	ACCESS SPEED	RETENTION	CAPACITY FOR STORAGE
MAGNETIC CORE	HIGH	PERMANENT, ERASABLE	LOW
MAGNETIC DISC OR DRUM	MEDIUM	PERMANENT, ERASABLE	HIGH
MAGNETIC TAPE	LOW	PERMANENT, ERASABLE	HIGH
PUNCH CARD	LOW	PERMANENT, NONERASABLE	UNLIMITED (LIMITED TO 80 CHARACTERS PER CARD)
MAGNETIC BUBBLE	VERY FAST	PERMANENT, ERASABLE	VERY HIGH

COMMON FEATURES OF DATA PROCESSING SYSTEMS
MINI-UNIT III

ASSIGNMENT SHEET #1--ANALOG AND DIGITAL DEVICES

Classify the following devices as either analog or digital computers.

	CHECK ONE	
	ANALOG	DIGITAL
1. Speedometer	______	______
2. Thermostat	______	______
3. Abacus	______	______
4. Slide Rule	______	______
5. Barometer	______	______
6. "Hand-Held" Calculator	______	______
7. Thermometer	______	______
8. Cash Register	______	______
9. Bathroom Scale	______	______

ANSWERS TO ASSIGNMENT SHEETS

ASSIGNMENT SHEET #1

1. Analog
2. Analog
3. Digital
4. Analog
5. Analog
6. Digital
7. Analog
8. Digital
9. Analog

DATA PROCESSING CONCEPTS
MINI-UNIT III

COMMON FEATURES OF DATA PROCESSING SYSTEMS

TEST

1. TRUE OR FALSE: Using "T" or "F", indicate if the following are true or false.

____a. A console typewriter is a device used to converse with a computer.

____b. A special printing device that has the capability to print continuous line drawings is known as a graphic printer.

____c. A device that produces a permanent hard copy in the form of characters or symbols on paper or card stock is called a plotter.

____d. A paper tape reader is used to read information punched on a paper tape.

____e. An electronic vacuum tube that displays output data on a screen by means of controlled electron beams is called a vacuum ray tube unit.

____f. An optical character reader is capable of reading characters and bar codes from handwritten, typed, and printed paper documents.

____g. A card reader reads data stored in a punch card and then prints it in final copy.

____h. A device which transfer data to and from the computer is called a magnetic type unit.

____i. A card punch is used to record data from source documents.

2. MULTIPLE CHOICE: Circle the number of the correct answer.

a. The CPU is one part of the __?__ unit of a system.

1. control
2. processor
3. arithmetic/logic
4. input

b. A computer which performs its operations by counting is a/an

1. analog.
2. arithmetic.
3. punch card.
4. digital.

c. The ? unit of a CPU directs and coordinates the entire computer system.

1. analog
2. arithmetic
3. control
4. output

d. The device through which programs and data are entered into a computer is the

1. input unit.
2. punch card.
3. central processing unit.
4. magnetic core.

e. Punch cards store data on a

1. tape.
2. card.
3. drum.
4. core.

f. A computer which performs its operations by measuring is called a/an ? computer.

1. input
2. digital
3. analog
4. output

g. ? unit uses "built-in" operations to perform calculations.

1. Control
2. Input
3. Arithmetic/logic
4. Output

h. A small doughnut-shaped magnet which stores data is called a magnetic

1. core.
2. card.
3. drum.
4. disk.

i. The ? unit does the actual work of problem solving and directs the flow of data to and from the other units.

1. input
2. output
3. control
4. central processing

j. Data can be stored as spots on magnetic

1. drums.
2. bubbles.
3. tapes.
4. cards.

k. The device which transmits data originating from within the computer into an understandable form is the __?__ unit.

1. arithmetic/logic
2. analog
3. output
4. input

3. MATCHING: Match the terms on the right to their correct definition.

_____a. Equipment that is directly connected to the system.

_____b. Programs stored in a nonerasable memory.

_____c. The complete set of instructions to the computer which are necessary to solve problems.

_____d. A high-speed, electronic, digital calculating device which has provisions for internal storage of a program and data.

_____e. A data processing system which permits many users to use the system at the same time.

_____f. Retrieval or storage of data by a reference to its location on a volume, rather than related to previously retrieved stored data.

_____g. Input/output devices that are exterior to the main frame of the computer.

_____h. Equipment not connected directly to the system.

_____i. The term used to describe all programs used by the computer system.

_____j. An identification represented by a name, label, or number for a location in storage.

_____k. The physical equipment or devices of a system forming a computer and its peripheral equipment.

1. Address
2. Computer
3. Firmware
4. Hardware
5. Offline
6. Online
7. Peripheral equipment
8. Program
9. Random access
10. Software
11. Time-sharing

DATA PROCESSING CONCEPTS
MINI-UNIT III

COMMON FEATURES OF DATA PROCESSING SYSTEMS

ANSWERS TO PRETEST

1. a. 2
   b. 5
   c. 4
   d. 11
   e. 9
   f. 1
   g. 3
   h. 10
   i. 6
   j. 8
   k 7

2.

a.	digital	high	fast	low	excellent	counting of discrete pulses
b.	analog	low	very fast	low	limited	measures and simulates nature
c.	hybrid	high	very fast	low	unlimited	

3. a. Central processing unit (CPU)--The CPU is the heart of the computer system. It interprets the instructions in a computer program, performs the calculations and the moving of data as specified by the program, and controls the input/output operations of the system. The CPU is one part of the processor unit of a system; the second part being the main computer storage. Data to be processed is stored in the main computer storage and is then referenced by the CPU so that processing can occur. The CPU consists of the arithmetic/logic unit and the control unit.

   b. Arithmetic/logic unit--Uses "built-in" operations to perform arithmetic operations such as addition, subtraction, multiplication, and division. It can also perform logical operations such as comparing one number to another and indicating the results of the comparison.

   c. Control unit--Directs and coordinates the entire computer system which includes controlling the input/output units, controlling the operations of the arithmetic/logic unit, and transferring data to and from the main computer storage.

   d. Input unit--Presents data to the processor unit of the computer system for the processing of the data. This data is put on some type of media (tape, cards, disk, etc.) in machine-readable format.

   e. Output unit--A device which displays, prints, or otherwise makes information available to people. Two popular forms of output are the printed report and the CRT terminal.

4.	a.	Data stored on doughnut-shaped magnets	High	Permanent, Erasable	Low
	b.	Data stored as magnetic spots on tracks on each surface	Medium	Permanent, Erasable	High
	c.	Data stored as magnetic spots on tape	Low	Permanent, Erasable	Unlimited
	d.	Data stored by punched holes in a paper card	Low	Permanent, Non-erasable	Unlimited
	e.	Microscopic magnetized bubbles are stored on the surface of a magnetic tape	Very fast	Permanent, Erasable	Very High

5. a. 5
b. 7
c. 3
d. 8
e. 1
f. 6
g. 9
h. 4
i. 2

DATA PROCESSING CONCEPTS
MINI-UNIT III

COMMON FEATURES OF DATA PROCESSING SYSTEMS

ANSWERS TO TEST

1. True or False.

   a. T
   b. F
   c. F
   d. T
   e. F
   f. T
   g. F
   h. T
   i. T

2. Multiple Choice.

   a. 2
   b. 4
   c. 3
   d. 1
   e. 2
   f. 3
   g. 3
   h. 1
   i. 4
   j. 3
   k. 3

3. Matching.

   a. 6
   b. 3
   c. 8
   d. 2
   e. 11
   f. 9
   g. 7
   h. 5
   i. 10
   j. 1
   k. 4

DATA PROCESSING CONCEPTS
MINI-UNIT IV

PROGRAMMING CONCEPTS AND DOCUMENTATION

After completion of this mini-unit, the student should be familiar with basic programming concepts and documentation. This knowledge will be evidenced through completion of assignments and by scoring 90% on the mini-unit test.

SPECIFIC OBJECTIVES

After completion of this mini-unit, the student should be able to:

1. Match terms related to basic programming concepts and documentation to the correct definitions.
2. List the steps in using a computer to solve a problem.
3. Identify the standard flowcharting symbols by their functions.
4. Develop an algorithm for a given problem.
5. Construct a flowchart from a previously written algorithm using the flowcharting guidelines.
6. List three basic types of programming languages.
7. List the information required in the documentation of a program.
8. List the criteria to consider when choosing a programming language.
9. List four major high-level programming languages.

DATA PROCESSING CONCEPTS
MINI-UNIT IV

PROGRAMMING CONCEPTS AND DOCUMENTATION

SUGGESTED ACTIVITIES

I. Instructor:

- A. Give pretest.
- B. Provide student with objective sheet.
- C. Provide student with information and assignment sheets.
- D. Make transparencies; discuss examples.
- E. Discuss unit and specific objectives.
- F. Discuss information and assignment sheets.
- G. Give test.

II. Student:

- A. Take pretest.
- B. Read objective sheet.
- C. Study information sheets.
- D. Study example sheets (Transparency Masters).
- E. Complete assignment sheets.
- F. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

- A. Objective sheet.
- B. Information sheet.
- C. Transparency masters: #1 - Flowchart Symbols
  - #2 - Example of an Algorithm
  - #3 - Example of a Flowchart

D. Assignment sheets: #1 - Develop an Algorithm.

#2 - Construct a Flowchart.

E. Answers to assignment sheets.

F. Pretest and test.

G. Answers to pretest and test.

II. References:

A. Condon, Robert J. Data Processing with Applications. Reston, Virginia: Reston Publishing Company, Inc., 1978.

B. DeRossi, Claude J. Exploring the World of Data Processing. Reston, Virginia: Reston Publishing Company, Inc., 1975.

C. _____ "How Computers Work", (filmstrip/cassette set), Encyclopedia Britannica, Corp., 1972. Filmstrip #6 - "The History of the Computer".

D. Squire, Enid. The Computer: An Everyday Machine. Canada: Addison-Wesley, Ltd., 1972.

E. Wu, Margaret S. Introduction to Computer Data Processing, second edition. New York: Harcourt Brace Jovanovich, Inc., 1979.

F. References available in your school.

DATA PROCESSING CONCEPTS
MINI-UNIT IV

PROGRAMMING CONCEPTS AND DOCUMENTATION

PRETEST

1. Match the terms on the right to the correct definition.

_____a. The process of detecting, locating, and eliminating errors in a program.

_____b. The repeating of a sequence of instructions.

_____c. Writing sequences of instructions.

_____d. A schematic or graphic presentation of the logic required to solve a problem.

_____e. Order of succession; in flowcharting steps following one after another.

_____f. The program which causes a computer to translate higher-level programs into machine language programs.

_____g. In flowcharting, the choice of an alternative action based on a condition.

_____h. A series of instructions which direct the computer to perform a sequence of tasks that produce a desired output.

_____i. A step-by-step procedure for accomplishing a result.

_____j. The beginning of the set of symbols in a flowchart.

_____k. The process of logically organizing information which will be generated in producing a computer program into a useful file that continually reflects the current state of the program.

_____l. The end of the set of instructions in a flowchart.

_____m. To alter the sequential flow of steps in a program.

1. Algorithm
2. Branch
3. Coding
4. Compiler
5. Debugging
6. Decision
7. Flowchart
8. Initialization
9. Loop
10. Program
11. Program documentation
12. Sequence
13. Termination

2. List the steps in using a computer to solve a problem.

   a.

   b.

   c.

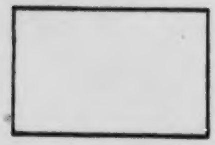
   d.

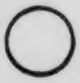
   e.

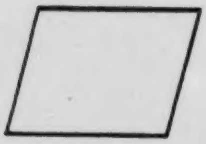
   f.

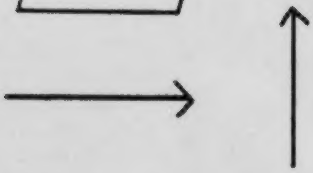
   g.

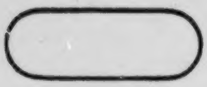
3. Identify the following flowcharting symbols by their function.

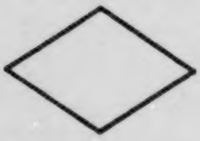
   a. 

   b. 

   c. 

   d. 

   e. 

   f. 

4. Describe the three basic types of programming languages.

   a. Machine -

   b. Assembler -

   c. High-level -

5. List the information required in the documentation of a program.

   a.

   b.

   c.

   d.

   e.

   f.

6. List the criteria to consider when choosing a programming language.

   a.

   b.

   c.

   d.

   e.

   f.

7. List four major high-level programming languages.

a.

b.

c.

d.

DATA PROCESSING CONCEPTS
MINI-UNIT IV

PROGRAMMING CONCEPTS AND DOCUMENTATION

INFORMATION SHEET

I. Terms and definitions

   A. Algorithm--A step-by-step procedure for accomplishing a result; similar to following a recipe. Usually it is a simplified procedure for accomplishing a complex result.

   B. Branch--To alter the sequential flow of steps in a program.

   C. Coding--Writing sequences of instructions.

   D. Compiler--The program which causes a computer to translate higher-level programs into machine language programs.

   E. Debugging--The process of detecting, locating, and eliminating errors in a program.

   F. Decision--In flowcharting, the choice of an alternative action based on a condition.

   G. Flowchart--A graphic presentation of the logic required to solve a problem.

   H. Initialization--The beginning of the set of instructions in a flowchart.

   I. Loop--The repeating of a sequence of instructions.

   J. Program--A series of instructions which direct the computer to perform a sequence of tasks that produce a desired output.

   K. Program documentation--The process of logically organizing information which will be generated in producing a computer program into a useful file that continually reflects the current state of the program; includes written text and flowcharts.

   L. Sequence--Order of succession; in flowcharting, steps following one after another.

   M. Termination--The end of the set of instructions in a flowchart.

II. Steps in using a computer to solve a problem:

   A. Have a precise statement of the problem.

   B. Develop an algorithm.

   C. Construct a flowchart.

D. Write a program.

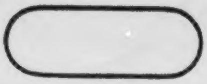
E. Communicate with the computer.

F. Debug the program.

G. Document the program.

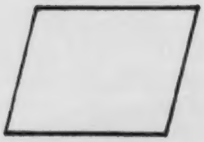
III. Flowcharting symbols (See TM 1)

A.



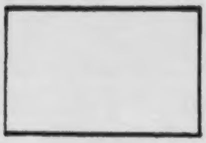
--Terminal activity (begin, start, stop, or end)

B.



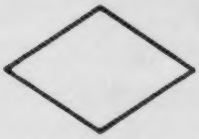
--Input/Output

C.



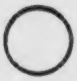
--Process

D.



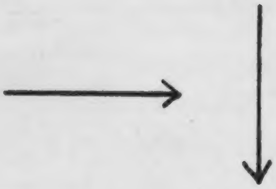
--Decision

E.



--Connector

F.



Flowlines
--Direction of arrows shows flow of logic

IV. Flowcharting guidelines

  A. Use standard flowcharting symbols.

  B. Convert to instructions acceptable to computer.

  C. Try to keep flow of logic from top to bottom and from left to right.

  D. Avoid intersection of lines used to depict flow of logic.

  E. Use connectors to reduce the number of flow lines.

V. Three basic types of programming languages

  A. Machine--A language for writing instructions in a form to be executed directly by the computer. The language directly intelligible by the control section of the machine.

  B. Assembler--A programming language which allows a user to write a program using symbols instead of numeric instructions (machine dependent). Each computer has its own assembler language.

  C. High-level Language--A computer programming language which is intended to be independent of a particular computer. (EX: BASIC, COBOL, etc.)

VI. Criteria to consider when selecting a programming language

  A. Ease of learning.

  B. Ease of coding and understanding.

  C. Ease of debugging.

  D. Ease of maintaining.

  E. Program development time.

  F. Compilation.

VII. Major high-level programming languages

  A. BASIC--An acronym for Beginner's All-purpose Symbolic Instruction Code. It is a computer language that is used in conversational time-sharing.

  B. FORTRAN--FORmula TRANslation language which is designed for problems which can be expressed in algebraic notations.

  C. COBOL--COmmon Business Oriented Language which is used primarily in business applications.

  D. RPG--Report Program Generator language designed to provide an easy method of generating routine business reports.

VIII. Information required in the documentation of a program

A. A description of the problem written in English.

B. A flowchart.

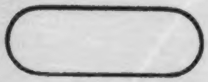
C. A symbolic listing of the program.

D. Steps needed to operate the program.

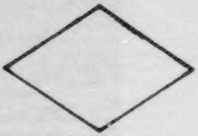
E. Test cases and sample results.

F. A list of error conditions.

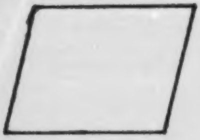
FLOWCHARTING SYMBOLS



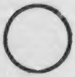
TERMINAL ACTIVITY
START-STOP



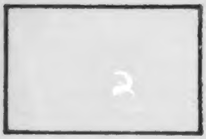
DECISION



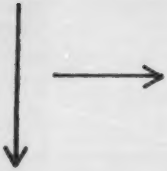
INPUT/OUTPUT



CONNECTOR



PROCESS



FLOWLINES

ALGORITHM EXAMPLE

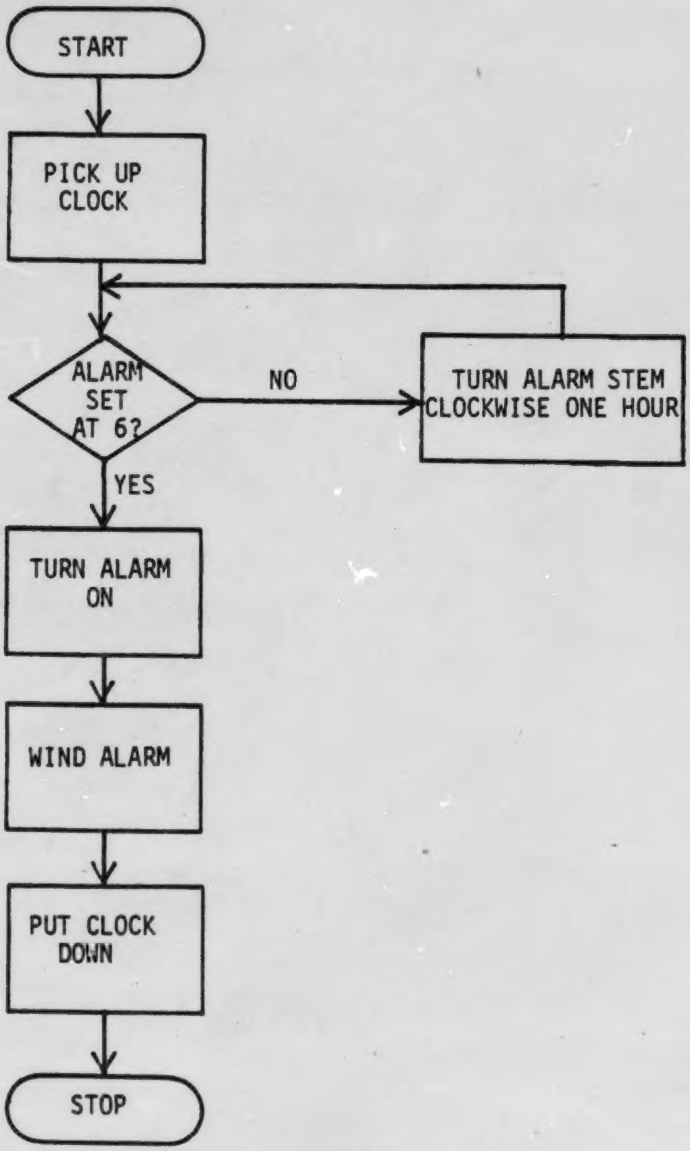
THIS ALGORITHM SOLVES THE PROBLEM OF SETTING AN ALARM CLOCK TO RING AT 6 O'CLOCK:

```
1.  START
2.  PICK UP CLOCK
3.  DECISION:  ALARM SET AT 6?
               YES:  GO TO 6
               NO:   GO TO 4

4.  TURN ALARM STEM CLOCKWISE ONE HOUR
5.  GO TO 3
6.  TURN ALARM ON
7.  WIND ALARM
8.  PUT CLOCK DOWN
9.  STOP
```

FLOWCHART EXAMPLE

THIS FLOWCHART WAS CONSTRUCTED FROM THE ALGORITHM ON TM 2


START
PICK UP CLOCK
ALARM SET AT 6?
NO
TURN ALARM STEM CLOCKWISE ONE HOUR
YES
TURN ALARM ON
WIND ALARM
PUT CLOCK DOWN
STOP

DATA PROCESSING CONCEPTS
MINI-UNIT IV

PROGRAMMING CONCEPTS AND DOCUMENTATION

ASSIGNMENT SHEET #1--DEVELOPING AN ALGORITHM

A robot is standing a short distance from a window. Develop and write an algorithm of the procedure to have the robot walk to the window, open it, and return to his original place. The robot is facing the window.

Listed below are the only movements the robot is programmed to make:

Activate (begin procedure)

Arms Forward (arms straight out)

Arms Up (to raise window)

Arms Down

Turn (turn 90 degrees to the right)

Walk (take one step at a time)

Zero (set the counter at zero)

Add (add 1 to counter)

Subtract (subtract 1 from counter)

Decision: At window (test for touching window, arms must be forward)

Decision: Counter zero (test if counter is zero)

Deactivate (stop procedure)

DATA PROCESSING CONCEPTS
MINI-UNIT IV

PROGRAMMING CONCEPTS AND DOCUMENTATION

ASSIGNMENT SHEET #2--CONSTRUCT A FLOWCHART

Construct a flowchart for the steps of the algorithm you listed on Assignment Sheet #1.

DATA PROCESSING CONCEPTS
MINI-UNIT IV

PROGRAMMING CONCEPTS AND DOCUMENTATION

ANSWERS TO ASSIGNMENT SHEET #1

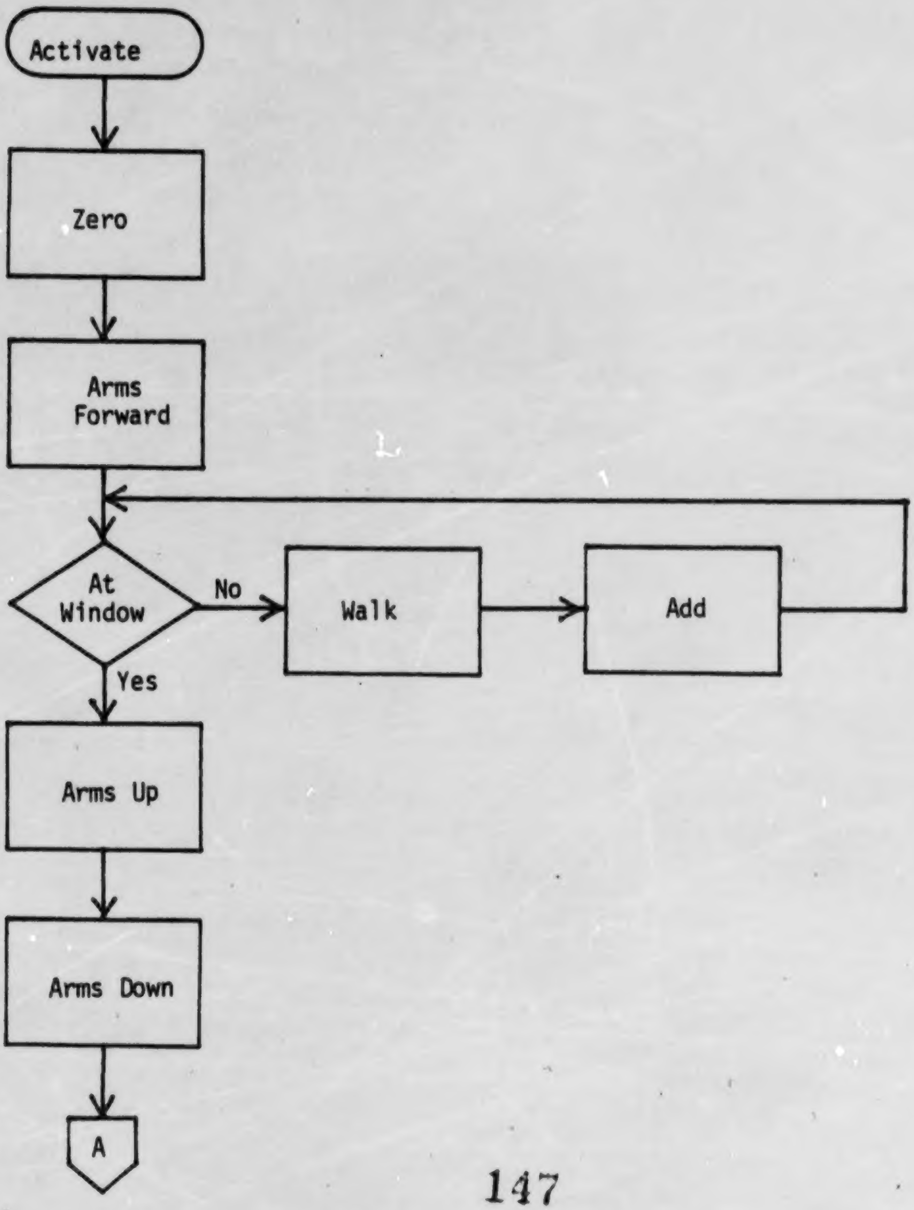
This is just one of many solutions to the problem:

```
 1.  Activate
 2.  Zero
 3.  Arms Forward
 4.  Decision:  At Window Yes:  Go to 8
                           No:  Go to 5
 5.  Walk
 6.  Add
 7.  Go to 4
 8.  Arms Up
 9.  Arms Down
10.  Turn
11.  Turn
12.  Decision:  Counter Zero Yes:  Go to 16
                              No:  Go to 13
13.  Walk
14.  Subtract
15.  Go to 12
16.  Turn
17.  Turn
18.  Deactivate
```

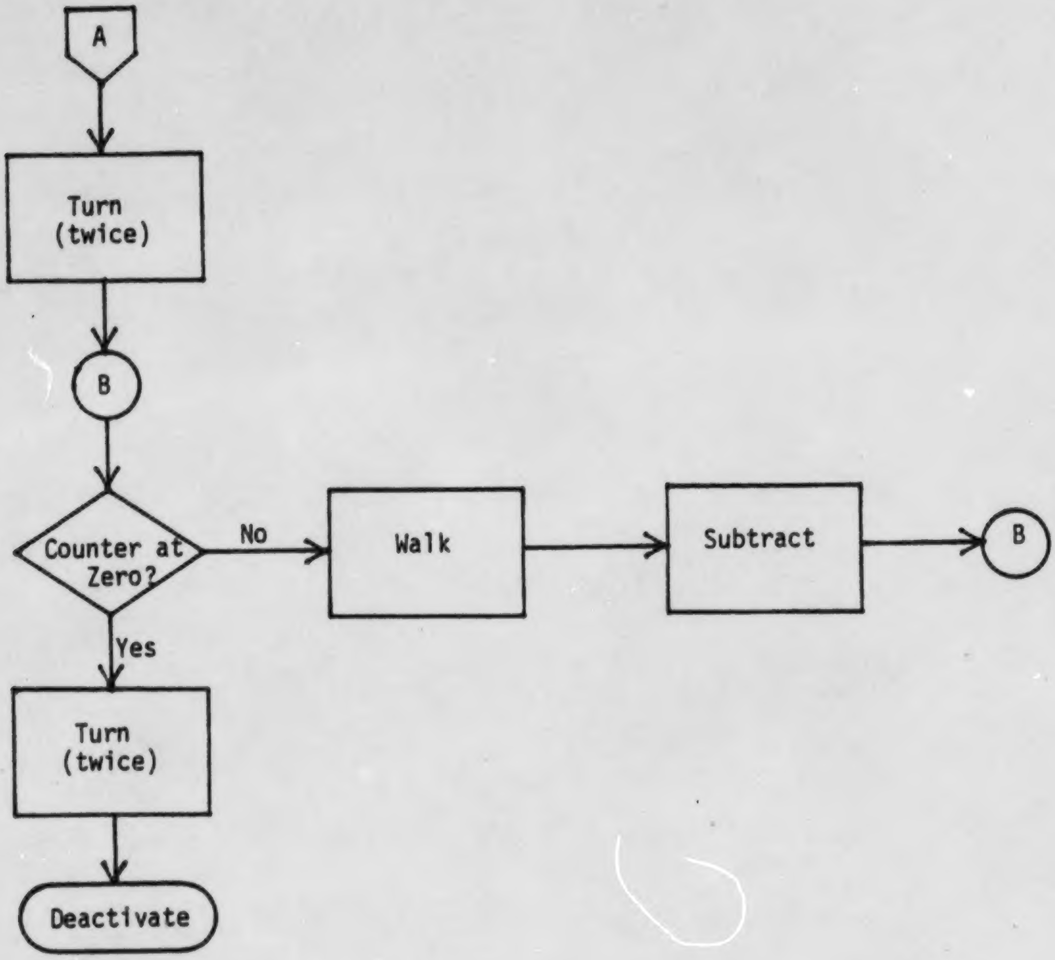
DATA PROCESSING CONCEPTS
MINI-UNIT IV

PROGRAMMING CONCEPTS AND DOCUMENTATION

ANSWER TO ASSIGNMENT SHEET #2


Activate
Zero
Arms Forward
At Window
No
Walk
Add
Yes
Arms Up
Arms Down
A

PCD 19


A
Turn (twice)
B
Counter at Zero?
No
Walk
Subtract
B
Yes
Turn (twice)
Deactivate

DATA PROCESSING CONCEPTS
MINI-UNIT IV

PROGRAMMING CONCEPTS AND DOCUMENTATION

TEST

1. TRUE OR FALSE: Using "T" or "F", indicate if the following statements are true or false.

_____a. When developing a flowchart, try to keep flow of logic from top to bottom and from left to right.

_____b. A flowchart is a graphic presentation of the logic required to solve a problem.

_____c. Sequencing is the repeating of a series of instructions.

_____d. COBOL and FORTRAN are high-level languages, while BASIC is a machine language.

_____e. Documentation is a fancy word programmers use to mean they wrote a flowchart.

_____f. BASIC--Business' Accounting System Inventory Control--is used primarily in business applications.

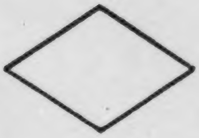
_____g. FORTRAN is a high-level language which is intended to be independent of a particular computer.

_____h. When writing documentation for a program, test cases and sample results are needed.

_____i. To code a program is to write instructions in sequence.

_____j. In flowcharting, when a decision needs to be made, a connector is always used.

2. MULTIPLE CHOICE: Circle the number of the correct answer.

a.  is the symbol for

1. decision.
2. process.
3. start.
4. stop.

b. The built-in language of a particular computer is known as __?__ language.

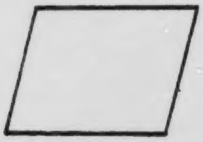
1. FORTRAN
2. assembler
3. machine
4. COBOL

c. The beginning of the set of instructions in a flowchart is called

1. termination.
2. initialization.
3. documentation.
4. standardization.

d. A series of instructions which directs the computer to perform a sequence of tasks that produce a desired output is a/an

1. flowchart.
2. program.
3. algorithm.
4. loop.

e.  is the symbol for

1. process.
2. connector.
3. input/output
4. flow.

f. ? is a programming language which uses symbols instead of numeric instructions.

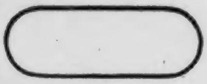
1. Assembler
2. RPG
3. BASIC
4. Compiler

g. The process of logically organizing information which will be generated in producing a computer program into a useful file is called

1. programming.
2. sequencing.
3. flowcharting.
4. program documentation.

h. ? is the process of detecting, locating, and eliminating errors in a program.

1. Deciding
2. Documenting
3. Looping
4. Debugging

i.  is the symbol for

1. direction.
2. decision.
3. terminal activity.
4. processing.

j. The ? symbol is used to reduce the number of flow lines.

1. process
2. connector
3. decision
4. arrowhead

DATA PROCESSING CONCEPTS
MINI-UNIT IV

PROGRAMMING CONCEPTS AND DOCUMENTATIONS

ANSWERS TO PRETEST

1.	a.	5	d.	7	g.	6	j.	8
	b.	9	e.	12	h.	10	k.	11
	c.	3	f.	4	i.	1	l.	13
							m.	2

2. Answers should appear in the following order:

   a. Have a precise statement of the problem.

   b. Develop an algorithm.

   c. Construct a flowchart.

   d. Write a program.

   e. Communicate with the computer.

   f. Debug the program.

   g. Document the program.

3. a. Process

   b. Connector

   c. Input/Output

   d. Direction of arrow shows flow of logic

   e. Terminal activity (initialize or terminate)

   f. Decision

4. a. Machine--A language for writing instructions in a form to be executed directly by the computer. The language directly intelligible by the control section of the machine.

   b. Assembler--A programming language which allows a user to write a program using symbols instead of numeric instructions.

   c. High-level Language--A computer programming language which is intended to be independent of a particular computer.

5. a. A description of the problem written in English.
   b. A flowchart.
   c. A symbolic listing of the program.
   d. Steps needed to operate the program.
   e. Test cases and sample results.
   f. A list of error conditions.
6. a. Ease of learning.
   b. Ease of coding and understanding.
   c. Ease of debugging.
   d. Ease of maintaining.
   e. Program development time.
   f. Compilation.
7. a. BASIC
   b. FORTRAN
   c. COBOL
   d. RPG

DATA PROCESSING CONCEPTS
MINI-UNIT IV

PROGRAMMING CONCEPTS AND DOCUMENTATIONS

ANSWERS TO TEST

1. True or False:

   a. T
   b. T
   c. F
   d. F
   e. F
   f. F
   g. T
   h. T
   i. T
   j. F

2. Multiple Choice:

   a. 1
   b. 3
   c. 2
   d. 2
   e. 3
   f. 1
   g. 4
   h. 4
   i. 3
   j. 2

DATA PROCESSING CONCEPTS
MINI-UNIT V

DATA PROCESSING APPLICATIONS AND CAREERS

MINI-UNIT OBJECTIVE

After completion of this mini-unit, the student should be familiar with data processing applications and careers. This knowledge will be evidenced by completion of assignment and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this mini-unit, the student should be able to:

1. Match terms related to data processing applications and careers to their correct definition.
2. Describe two types of data processing systems.
3. List three applications on online realtime systems.
4. List the advantages of online realtime systems.
5. List three applications of batch processing systems.
6. List four data processing careers.

DATA PROCESSING CONCEPTS
MINI-UNIT V

DATA PROCESSING APPLICATIONS AND CAREERS

SUGGESTED ACTIVITIES

I. Instructor:

  A. Give pretest.

  B. Provide student with objective sheet.

  C. Provide student with information and assignment sheets.

  D. Make transparency.

  E. Discuss unit and specific objectives.

  F. Discuss information and assignment sheets.

  G. Plan field trip to local data processing firm or business which uses data processing.

  H. Assist students in making arrangements to interview a data processing person by providing them with a list of names.

  I. Give test.

II. Student:

  A. Take pretest.

  B. Read objective sheet.

  C. Study information sheets.

  D. Complete assignment sheet.

  E. Attend field trips.

  F. Take test.

(INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet.

  B. Information sheet.

  C. Assignment Sheet #1 - Exploring Careers in Data Processing.

D. Pretest and test.

E. Answers to pretest and test.

II. References

A. Albrecht, Robert L., Eric Lindberg, and Mara Walter. *Computer Methods in Mathematics*. Addison-Wesley Publishing Company, 1969.

B. Cashman, Thomas J., and William J. Keys. *Data Processing and Computer Programming*. Canfield Press, 1971.

C. Colbert, Douglas A. *Data Processing Concepts*. McGraw Hill Publishing Company, 1968.

D. Corliss, William R. *Computers*. U. S. Energy and Research and Development Administration, 1973.

E. Feingold, Carl. *Introduction to Data Processing*. Wm. C. Brown Company Publishers, 1971.

F. Gibson, Phillip J., Jerry D. Chivers, and David R. Burnham. *What is Data Processing?* Idaho State University School of Vocational Technical Education, 1973.

G. Marxer, Ellen. *Elements of Data Processing*. Delmar Publishers, 1971.

H. Popkin, Gary S. and Arthur H. Pile. *Introduction to Data Processing*. Houghton Mifflin Company, 1977.

I. _____, *Scientific Data Processing Technology*. U.S. Department of Heath Education and Welfare, 1970.

J. Spencer, Donald D. *Introduction to Information Processing*. Charles E. Merril Publishing Company, 1977.

K. Wanous, S. J., E. E. Wanous, and Gerald E. Wagner. *Fundamentals of Data Processing*. Southwestern Publishing Company, 1971.

L. Wood, Merle W. *You Are A Data Processor*. Southwestern Publishing Company, 1972.

M. Rescources available in your school.

DATA PROCESSING CONCEPTS
MINI-UNIT V

DATA PROCESSING APPLICATIONS AND CAREERS

PRETEST

1. Match the terms on the right to the correct definition.

____a. An instructional technique using a computer that is previously programmed with sets of questions on specific topics and serves as an individual tutorial aide.

____b. Under control of a central processing unit.

____c. A data processing system which collects data over a period of time and then processes the data at a scheduled time.

____d. A secondary storage medium, such as magnetic disk, in which any record can be stored and retrieved in any order.

____e. A condition in which direct communication with a computer is not possible.

____f. A series of instructions which direct the computer to perform a sequence of tasks that produce a desired output.

____g. The part of a computer containing the systems arithemetic, logic, and control functions.

____h. Processing data into information almost at once, usually so the information can be used as it is produced.

____i. A data processing system which permits many users to use the system at the same time.

1. Batch processing
2. Central processing unit
3. Computer assisted instruction
4. Direct access storage
5. Offline
6. Online
7. Program
8. Realtime
9. Time-sharing

2. Describe these types of data processing systems.

a. Online realtime -

b. Batch processing -

3. List three types of applications of online realtime systems.

   a.

   b.

   c.

4. List three types of applications of batch processing systems.

   a.

   b.

   c.

5. Describe two advantages of online realtime systems.

   a.

   b.

6. List four types of data processing careers.

   a.
   b.
   c.
   d.

DATA PROCESSING CONCEPTS
MINI-UNIT V

DATA PROCESSING APPLICATIONS AND CAREERS

INFORMATION SHEET

I. Terms and definitions:

A. Batch processing--A data processing system which collects data over a period of time and then processes them at a scheduled time.

B. Central processing unit (CPU)--The part of a computer system containing the systems arithmetic, logic, and control functions.

C. Computer assisted instruction (CAI)--An instructional technique using a computer that is previously programmed with sets of questions on specific topics and serves as an individual tutorial aide.

D. Direct access storage--A secondary storage medium, such as magnetic disk, in which any record can be stored and retrieved in any order.

E. Online--Under control of a central processing unit.

F. Offline--A condition in which direct communication with a computer is not possible.

G. Program--A series of instructions which direct the computer to perform a sequence of tasks that produce a desired output.

H. Realtime--Processing data into information almost at once, usually so the information can be used as it is produced.

I. Time sharing--A data processing system which permits many users to use the system at the same time.

II. Types of data processing systems.

A. Online realtime system--A data processing system operating online and realtime.

B. Batch processing system--A data processing system which collects data over a period of time and then processes the data at a scheduled time.

III. Application of online realtime systems.

A. Banking--A system might use communication equipment supplied by a telephone company and controlled by a computer to receive input, answer queries, search files, and send back responses to bank tellers at their windows in a brief time.

B. Medicine--Some "hospital information systems" are designed so that all that is known about a patient is available, almost immediately, from terminals connected to computer maintained files.

C. Education--Some schools have successfully used computers to "tutor" students. Elaborate programs of "computer-assisted" instructions have been developed. Online CAI terminals with direct access to a properly programmed computer, can also keep a detailed record of each student's performance.

IV. Application of batch processing systems.

A. Business--Businesses use batch processing when billing customers. Data concerning customers is collected and then processed before a bill is sent.

B. Government--The government is the largest user of computer processing. Batch processing is used to process tax returns, payrolls, personnel data, and the census.

C. Science--Scientists can collect and store data from experiments in a batch processing system. When the work is complete, the data can then be processed and interpreted.

V. Data processing careers.

A. Systems analyst--Defines and analyzes all applications that are to be computerized. They design a plan for the programmer and work with users to determine output requirements and formats of input.

B. Computer progammer--Takes a workable plan from the systems analyst and codes this plan in a computer language. They supply the internal checks and controls in the programs they write. They also write clear instructions to the other humans involved in the data processing cycle.

C. Computer operator--Takes the program instructions written by the programmer and puts them into the computer to complete the job. They control all peripheral equipment and correct operating problems that may occur.

D. Data entry operator--Transfers data from source documents to the computer. Good typing skills, accuracy in one's work, and the ability to work under pressure are attributes important to this job.

DATA PROCESSING CONCEPTS
MINI-UNIT V

DATA PROCESSING APPLICATIONS AND CAREERS

ASSIGNMENT SHEET #1--EXPLORING CAREERS IN DATA PROCESSING

Identify a career in data processing that you are interested in. With the help of your instructor, arrange to interview a person who holds such a job. You will want to find answers to the following questions and any other questions you may think of. After the interview, write a report about your experience; turn it in to your instructor.

Name of Person Interviewed.______________________________

Position Held or Job Title.______________________________

Name of Company.______________________________

Years of Experience in Data Processing.______________________________

Years of Experience Prior to This Job.______________________________

Amount of Education. (YEARS)______________________________

Type of Education.______________________________

Place of Education.______________________________

Years of Experience Needed for Their Job.______________________________

What They Do On Their Job.______________________________

____

What They Like About Their Job.______________________________

____

What They Dislike About Their Job.______________________________

____

Salary Range For Their Job Title.______________________________

Working Hours.______________________________

What Job Would Be Next For Advancement From Their Current Position or Title.__

____

DPAC 9

What Professional Organizations Do They Belong To.____________________

____

Working Conditions.______________________________

Dress Code.__________________________________

Fringe Benefits.________________________________

What Professional Magazines Should I Read.____________________

____

What Should I Do To Prepare For This Job.____________________

____

OTHER INFORMATION______________________________

____

____

____

____

____

____

DATA PROCESSING CONCEPTS
MINI-UNIT V

DATA PROCESSING APPLICATIONS AND CAREERS

TEST

1. MULTIPLE CHOICE: Circle the number of the correct answer.

   a. The part of a computer system containing the systems arithmetic, logic, and control functions is called the

      1. CPA.
      2. CPU.
      3. CAI.
      4. CIA.

   b. The __?__ takes a workable plan and codes the plan in a computer language.

      1. programmer
      2. operator
      3. analyst
      4. supervisor

   c. __?__ is used in business for customer billing.

      1. Computer operating
      2. Central processing
      3. Batch processing
      4. Realtime processing

   d. Equipment under control of a central processing unit is know to be

      1. offline.
      2. online.
      3. realtime.
      4. peripheral.

   e. A secondary storage medium in which any record can be stored and retrieved in any order is called

      1. central processing.
      2. online processing.
      3. direct access storage.
      4. offline storage.

   f. The __?__ transfers data from source documents to the computer.

      1. computer operator
      2. secretary
      3. programmer
      4. data entry operator

2. TRUE STATEMENTS: Circle the letter of all true statements.

   a. The government uses batch processing to process tax returns, payrolls, census information, and personnel data.

   b. A condition in which direct communication with a computer is not possible is called realtime.

   c. A program is a series of instructions which direct the computer to perform a sequence of tasks that produce a desired output.

   d. Computer analysts supply plans to users about output and input.

   e. Online realtime systems provide the rapid response needed if data is to be processed into information quickly.

   f. Computer operators control all peripheral equipment and correct operating problems that may occur.

   g. Online CAI terminals, with direct access to a properly programmed computer, can also keep a detailed record of each student's performance.

   h. Scientists can collect and store data from experiments in a batch processing system.

   i. Processing data into information almost at once is known as realtime processing.

DATA PROCESSING CONCEPTS
MINI-UNIT V

DATA PROCESSING APPLICATIONS AND CAREERS

ANSWERS TO PRETEST

1. a. 3
   b. 6
   c. 1
   d. 4
   e. 5
   f. 7
   g. 2
   h. 8
   i. 9

2. a. Online realtime system--A data processing system operating online and in realtime.

   b. Batch processing system--A data processing system which collects data over a period of time and then processes the data at a scheduled time.

3. a. Banking

   b. Medicine

   c. Education

4. a. Business

   b. Government

   c. Science

5. a. Online realtime systems provide the rapid responses needed if data are to be processed into information quickly enough to be useful in many types of application.

   b. Online realtime systems use computers to do what they do well--thus freeing humans to do the things that require human intelligence.

6. a. Systems Analyst

   b. Computer Programmer

   c. Computer Operator

   d. Data Entry Operator

DATA PROCESSING CONCEPTS
MINI-UNIT V

DATA PROCESSING APPLICATIONS AND CAREERS

ANSWERS TO TEST

1. Multiple Choice.

   a. 2
   b. 1
   c. 3
   d. 2
   e. 3
   f. 4

2. True Statements.

   a. T
   b. F
   c. T
   d. F
   e. T
   f. T
   g. T
   h. T
   i. F
   j. T

OFFLINE DATA ENTRY DEVICES

UNIT OBJECTIVE

After completion of this unit, the student should be able to operate an offline data entry device and perform clerical activities related to the operation of data processing equipment. This knowledge will be evidenced through demonstration and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to offline equipment to the correct definition.
2. Match the types of offline data entry equipment to their functions.
3. Describe components of an available offline data entry device.
4. Describe the special keys of an available offline data entry device by their function.
5. List procedures related to routine operator maintenance.
6. Demonstrate the ability to:
    a. Operate an available offline data entry device.
    b. Operate equipment to verify work.

PREREQUISITES

Basic Data Processing Concepts and Functions

Historical Development of Data Processing (optional)

Common Features of Data Processing Systems

Data Processing Applications and Careers (optional)

OFFLINE DATA ENTRY DEVICES

SUGGESTED ACTIVITIES

I. Instructor: NOTE: Due to the variety of offline equipment, parts III and IV of the Information Sheet are the responsibility of the instructor.

  A. Give pretest.

  B. Provide student with objective sheet.

  C. Provide student with information and job sheets.

  D. Discuss unit and specific objectives.

  E. Discuss information and job sheets.

  F. Show students actual pieces of equipment; not only equipment in the school, but that which is used in the community.

  G. Give test.

II. Student:

  A. Take pretest.

  B. Read objective sheet.

  C. Study information sheets.

  D. Be able to identify various pieces of offline data entry equipment.

  E. Complete job sheets.

  F. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet.

  B. Information sheets.

  C. Job sheets: #1 Operate an Offline Data Entry Device.

  #2 Operate Equipment to Verify Work.

  D. Pretest and test.

  E. Answers to pretest and test.

II. References:

A. Carver, D. K. Introduction to Business Data Processing. New York: John Wiley & Sons, Inc., 1979.

B. Couger, J. Daniel and Fred R. McFadden. A First Course in Data Processing. Santa Barbara: Wiley/Hanilton Publication, 1977.

C. DeRossi, Claude J. Exploring the World of Data Processing. Reston, Virginia: Reston Publishing Company, Inc., 1975.

D. Dock, V. Thomas and Edward Essick. Principles of Business Data Processing. Science Research Associates, 1978.

E. Fuori, William M., Anthony D'Arco, and Lawrence Orilia. Introduction to Computer Operations. New York: McGraw-Hill Book Company, 1973.

F. Orilia, Lawrence S. Introduction to Business Data Processing. New York: McGraw-Hill Book Company, 1979.

G. Wu, Margaret S. Introduction to Computer Data Processing, second edition. New York: Harcourt Brace Jovanovich, Inc., 1979.

H. Manufacturer operating manuals.

I. References available in your school.

OFFLINE DATA ENTRY DEVICES

PRETEST

1. Match the terms on the right to the correct definition.

_____a. An input/output medium which records and stores data in the form of punched holes.

_____b. The identification label placed at the beginning of a data file stored on magnetic tape.

_____c. A device equipped with a keyboard and some kind of display; capable of sending and receiving information.

_____d. A condition in which direct communication with a computer is not possible.

_____e. A small magnetic disk enclosed in a plastic envelope, used with minicomputer systems to provide a disk storage capacity.

_____f. A line on a CRT screen indicating what position to enter data onto.

_____g. A reflective strip placed at the end of a reel of magnetic tape indicating the physical end of that tape.

_____h. The data, preceding the header label, that identifies a specific reel of tape by a unique identification number.

_____i. A plastic ring that must be inserted onto a reel of tape to enable the writing of data on that tape.

_____j. The process that prints on a punch card the data already punched in the card.

_____k. A peripheral device used with key-to-tape systems to convert similar tapes.

_____l. A reflective strip at the beginning of tape indicating the physical point at which data can be recorded on that tape.

1. Cursor
2. Diskette
3. End-of-reel marker
4. File protection ring
5. Header label
6. Interpret
7. Load-point marker
8. Offline
9. Paper tape
10. Random access
11. Sequential file
12. Tape pooler
13. Terminal
14. Verification of data
15. Volume number

_____m. Random access (direct) file--A file structure in which data is written, read, and accessed in any order.

_____n. The process by which keyed data is checked for accuracy prior to input to the computer.

_____o. A file structure in which data is written, read, and accessed one record at a time.

2. Match the types of offline data entry equipment listed on the right to their correct function.

_____a. Employs a keyboard work station and a magnetic tape drive (reel or cassette) to key data onto low density magnetic tape.

_____b. This machine can be used to punch holes in cards, read and verify previously punched cards, or interpret cards that have been punched but not printed.

_____c. Uses a keyboard work station in conjunction with a tape read/punch to store data on paper tape.

_____d. Includes a keyboard device in conjunction with a disk drive to key data onto magnetic disk storage.

1. Keypunch/ Verifier
2. Key-to-disk
3. Key-to-paper tape
4. Key-to-tape

3. Describe the components of an available data entry device.

4. Describe the function of the special keys of the keyboard.

5. List 5 routine operator maintenance procedures.

   a.

   b.

   c.

   d.

   e.

OFFLINE DATA ENTRY DEVICES

INFORMATION SHEET

I. Terms and definitions

A. Cursor--A line on a CRT screen indicating what position to enter data onto.

B. Diskette "floppy disk"--A magnetic disk enclosed in a plastic envelop; used with minicomputer systems to provide a disk storage capacity.

C. End-of-reel marker--A reflective strip placed at the end of a reel of magnetic tape indicating the physical end of the tape.

D. File protection ring--A plastic ring that must be inserted onto a reel of tape to enable the writing of data on the tape.

E. Header label--The identification label placed at the beginning of a data file stored on magnetic tape.

F. Interpret--The process that prints, on a punch card, the data already punched in the card.

G. Load-point marker--A reflective strip at the beginning of a reel of tape indicating the physical point at which data can be recorded on the tape.

H. Offline--A condition in which direct communication with a computer is not possible.

I Paper tape--An input/output medium (similar to magnetic tape) which records and stores data in the form of punched holes along a continuous strip of paper.

J. Random access (direct) file--A file structure in which data is written, read, and accessed in any order.

K. Sequential file--A file structure in which data is written, read, and accessed one record at a time.

L. Tape pooler--A peripheral device used with key-to-tape systems to convert similar tapes of 20 BPI to large tape reels of 800 to 6400 BPI, which can be processed on the computer.

M. Terminal--A device equipped with a keyboard and some kind of display; capable of sending and receiving information.

N. Verification of data--The process by which keyed data is checked for accuracy prior to input to the computer.

O. Volume number--The data, preceding the header label, that identifies a specific reel of tape by a unique identification number.

II. Types of offline data entry equipment and their functions

A. Keypunch/verifier--This data entry device employs a keyboard, a punch station, a print head and a read station to key data onto 80- or 96-column cards. The machine can be used to punch holes in cards, read and verify previously punched cards, or interpret cards that have been punched but not printed.

B. Key-to-disk--This system includes a keyboard device in conjunction with a disk drive to key data onto magnetic disk storage. The system can be used to verify by sending stored data back to the terminal for inspection. This device is extremely advantageous to operations that handle a high volume of data via magnetic disk.

C. Key-to-tape--This system employs a keyboard work station an a magnetic tape drive (reel or cassette) to key data onto low density magnetic tape. The recorded data can then be transferred to computer via a tape pooler or by direct transmission. This system is invaluable to companies that are dependent upon the use of magnetic tapes, such as insurance companies.

D. Key-to-paper tape--This entry device uses a keyboard work station in conjunction with a tape/read punch to store data on paper tape. The punched data can be verified by reading back the punched tape and printing information on paper for inspection.

III. Components of an available data entry device

This section must be handled by the instructor because of the number of different offline devices used across the state.

IV. Special keys of the keyboard

This section must be handled by the instructor because of the number of different offline devices used across the state.

V. Routine operator maintenance procedures

   A. Inventory data processing supplies.

   B. Load forms, tapes, disks, etc.

   C. Make impression adjustments.

   D. Change ribbons (if applicable).

   E. Clean cover and keyboard.

   F. Clean screen(if applicable).

   G. Keep foreign objects away from equipment.

   H. Clean work area of materials after use.

OFFLINE DATA ENTRY DEVICES

JOB SHEET #1--OPERATE AN OFFLINE DATA ENTRY DEVICE

I. Tools and materials

A. Offline data entry device

B. Source document (see ODED 11)

II. Procedure

A. Power up entry equipment.

B. Load entry media, (disk, tape, cards, etc.).

C. Key information from source documents.

D. Remove label and file entry media.

E. Power down equipment.

F. Clean work area before leaving.

Refer To
Invoice No. 20401
Invoice Date 3/7

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28	Coconut	14	008	.80	22.40	14.11
16	Mops	65	135	3.10	49.60	31.25
29	Pickles	23	207	.34	9.86	6.21
40	Juice	19	216	1.40	56.00	35.28
200	Tea	25	263	2.88	576.00	362.88
150	Soup	76	272	2.60	390.00	245.70
14	Cat Food	73	335	4.50	63.00	39.69
27	Paper Plates	65	393	2.20	59.40	37.42
21	Honey	34	464	1.88	39.48	24.87
50	Soap	63	504	.64	32.00	20.16
80	Popcorn	12	513	1.25	100.00	63.00
12	Spaghetti	12	552	1.25	15.00	9.45
90	Dates	23	735	2.80	252.00	158.76
70	Onions	23	912	2.10	147.00	92.61
1	Ironing Board	65	996	9.60	9.60	6.05
				37.34	1,821.34	1,147.44

OFFLINE DATA ENTRY DEVICES

JOB SHEET #2--OPERATE EQUIPMENT TO VERIFY WORK

I. Tools and materials

   A. Offline data entry device

   B. Original source document (See Job Sheet #1)

   C. Previously entered data

II. Procedure

   A. Power up entry equipment.

   B. Load media to be verified (disk, tape, cards, etc.).

   C. Compare previously keyed information to source documents and perform necessary corrections.

   D. Remove label and file entry media.

   E. Power down equipment.

   F. Clean work area before leaving.

OFFLINE DATA ENTRY DEVICES

TEST

1. MULTIPLE CHOICE: Circle the number of the correct answer.

a. A ? must be inserted onto a reel of tape to enable the writing of data on the tape.

1. load-point marker
2. file protection ring
3. end-of-reel marker
4. verifier of data

b. The machine that can be used to punch holes in cards, read, and verify previously punched cards is a

1. tape pooler.
2. key-to-tape.
3. keypunch/verifier.
4. key-to-card.

c. A ? is equipped with a keyboard and some kind of display and is capable of sending and receiving information.

1. interpreter.
2. diskette.
3. header label.
4. terminal.

d. A file structure in which data is written, read, and accessed in any order is known as a

1. direct file.
2. sequential file.
3. random access file.
4. online file.

e. A ? keys data onto low density magnetic tape.

1. key-to-paper tape.
2. diskette.
3. tape pooler.
4. key-to-tape.

f. A reflective strip at the beginning of a reel of tape, indicating the physical point at which data can be recorded on the tape, is called a

1. beginning of-the-reel marker.
2. load-point marker.
3. header label.
4. cursor.

g. The data, preceding the header label, that identifies a specific reel of tape is called the

1. volume number.
2. file number.
3. load-point marker.
4. preliminary data number.

h. The ___?___ system can be used to verify by sending stored data back to the terminal for inspection.

1. keypunch.
2. key-to-disk.
3. key-to-paper tape.
4. interpreter.

i. A peripheral device used with key-to-tape systems is a

1. cursor.
2. file ring.
3. paper tape.
4. tape pooler.

j. The keypunch is a data entry device that uses ___?___ for recording information

1. paper tape.
2. magnetic tape.
3. cards.
4. disks.

2. TRUE OR FALSE: Using "T" or "F", indicate if the following statements are true or false.

____a. When direct communication with a computer is not possible, the system is said to be online.

____b. The verification of data is checking for accuracy of output prior to duplicating the run.

____c. The cursor is a line on a CRT screen that indicates what position to enter data onto.

____d. The header label is an identification label placed on the envelop of a diskette.

____e. A diskette is a plastic ring that is inserted onto a reel of tape.

____f. The interpret process prints on a punch card the data already punched in a card.

Routine operator maintenance may consist of the following:

____g. Clean cover and keyboard.

____h. Schedule all maintenance on all the equipment being used.

____i. Load forms, tapes, disks, etc.

____j. Clean work area of materials after use of equipment.

OFFLINE DATA ENTRY DEVICES

ANSWERS TO PRETEST

1. a. 9
   b. 5
   c. 13
   d. 8
   e. 2
   f. 1
   g. 3
   h. 15
   i. 4
   j. 6
   k. 12
   l. 7
   m. 10
   n. 14
   o. 11

2. a. 4
   b. 1
   c. 3
   d. 2

3. Handled by instructor.

4. Handled by instructor.

5. Answers may appear in any order and be any 5 of the following:
   a. Load forms, tapes, disks, etc.
   b. Make impression adjustments.
   c. Change ribbon (if applicable).
   d. Clean cover and keyboard.
   e. Clean screen (if applicable).
   f. Keep foreign objects away from equipment.
   g. Clean work area of materials after use.

OFFLINE DATA ENTRY DEVICES

ANSWERS TO TEST

NOTE: Sections III and IV of the Information Sheet are not covered in the test to this unit.

1. Multiple Choice.

   a. 2
   b. 3
   c. 4
   d. 1 or 3
   e. 4
   f. 2
   g. 1
   h. 2
   i. 4
   j. 3

2. True or False.

   a. F
   b. F
   c. T
   d. F
   e. F
   f. T
   g. T
   h. F
   i. T
   j. T

ONLINE COMPUTER TERMINAL

UNIT OBJECTIVE

After completion of this unit, the student should be able to operate an online computer terminal and perform clerical activities related to the operation of data processing equipment. This knowledge will be evidenced through demonstration and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms to the correct definitions related to online equipment.
2. Match the components of a computer to their description.
3. Match the special keys of the keyboard to their function.
4. List procedures related to routine operator maintenance.
5. Demonstrate the ability to:
    a. Operate an online computer terminal.
    b. Operate equipment to verify work.

PREREQUISITES

Basic Data Processing Concepts and Functions

Historical Development of Data Processing (optional)

Common Features of Data Processing Systems

Data Processing Applications and Careers (optional)

ONLINE COMPUTER TERMINAL

SUGGESTED ACTIVITIES

I. Instructor:

  A. Give pretest.

  B. Provide student with objective sheet.

  C. Provide student with information and job sheets.

  D. Make transparencies.

  E. Discuss unit and specific objectives.

  F. Discuss information and job sheets.

  G. Show students actual pieces of equipment; not only equipment in the school, but that which is used in the community.

  H. Give test.

II. Student:

  A. Take pretest.

  B. Read objective sheet.

  C. Study information sheets.

  D. Complete job sheets.

  E. Make sure you are able to identify various pieces of equipment.

  F. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet.

  B. Information sheets.

C. Transparency masters: TM 1 Communications Environment (via CRT)

TM 2 The Terminal

TM 3 Computer Terminal Hookups

TM 4 Teleptypewriter Keyboard

D. Job sheets: #1 Operate an online computer terminal

#2 Operate equipment to verify work

E. Pretest and test.

F. Answers to pretest and test.

II. References:

A. Carver, K. D. Introduction to Business Data Processing. New York: John Wiley & Sons, Inc., 1979.

B. Couger, J. Daniel and Fred R. McFadden. A First Course in Data Processing. Santa Barbara: Wiley/Hamilton Publication, 1977.

C. DeRossi, Claude J. Exploring the World of Data Processing. Reston, Virginia: Reston Publishing Company, Inc., 1975.

D. Dock, V. Thomas and Edward Essick. Principles of Business Data Processing. Science Research Associates, 1978.

E. Orilia, Lawrence S. Introduction to Business Data Processing. New York: McGraw-Hill Book Company, 1979.

F. Wu, Margaret S. Introduction to Computer Data Processing second edition. New York: Harcourt Brace Jovanovich, Inc., 1979.

G. Manufacturer operating manuals.

H. References available in your school.

ONLINE COMPUTER TERMINAL

PRETEST

1. Match the terms on the right to their correct definitions.

_____a. Output that is produced in a printed, permanent, and readable format.

_____b. The condition in which direct communication with a computer is not possible.

_____c. An identification number assigned by the data clerk to any data entering the data processing department.

_____d. The processing performed by a computer in which data is directly transmitted between input and output devices.

_____e. The number of characters transmitted per second in telecommunications.

_____f. A document from which information is removed to begin the processing of data.

_____g. A command to initiate communications with a time-sharing system.

_____h. A device which permits the telecommunication of data to and from a distant computer.

_____i. The process by which keyed data is checked for accuracy prior to input to the computer.

_____j. The reconversion of impulses at the end of telecommunications.

_____k. The transmission and processing of data via telephone lines and other high-speed communication means which support online processing.

_____l. A group of programs that completely satisfies and handles an entire computer application.

_____m. An electronic vacuum tube that displays output data on a screen by means of controlled electron beams.

1. Baud rate
2. Cathode ray tube
3. Console
4. Control number
5. Demodulation
6. Hardcopy
7. Logoff
8. Logon
9. Modem
10. Modulation
11. Offline
12. Online
13. Online processing
14. Program package
15. Remote job entry station
16. Softcopy
17. Software
18. Source document
19. Telecommunications
20. Time-sharing

_____n. The initial conversion of the impulses at the start of telecommunications.

_____o. All the programs, procedures, rules, peripheral data, and information concerned with the operation of a computer system.

_____p. The simultaneous use of the resources of an online computer system by a group of individuals.

_____q. A command to terminate communications with a time-sharing system.

_____r. The condition in which direct communication with a computer is possible.

_____s. The array of controls that allows an operator or maintenance engineer to communicate with and manually introduce data into a computer.

_____t. The recipient of computer services.

_____u. Computer output which assumes a visual, nonpermanent format.

_____v. A device used to convert machine-readable data into signals that can be transmitted over communication lines and facilities, and vice versa.

21. User

22. Verification of data

2. Match the components of a computer on the right to their correct description.

_____a. A device used as an interface between a telephone line and a terminal.

_____b. This device allows communications between operator and system or system and operator..

_____c. A device equipped with a keyboard and some kind of display, capable of sending and receiving information.

_____d. A device that performs the appropriate modulation/demodulation and control functions necessary to provide compatibility between computing machines and communication facilities.

1. Terminal
2. Keyboard
3. Visual display terminal
4. Printing
5. Acoustic coupler
6. Data set

_____e. A device for the manual encoding of data by depressing keys that cause the generation of the selected code element.

_____f. The keyboard on this terminal is used to enter data. As the keys are struck, the entered information appears on the screen.

3. Match the terms on the right to the correct description.

_____a. Moves the printing head or cursor back to the left margin and advances to the next line.

_____b. Used in conjunction with other keys on keyboard to perform control functions.

_____c. Stops transmission from host computer to terminal.

_____d. Held down to use a character shown on the top half of a key.

_____e. Terminates a program which is running, listing or punching; allows new information to be entered.

_____f. When used with a computer, it allows the terminal to receive transmission from host computer.

_____g. Used in sequence with other keys to produce special functions.

_____h. Eliminates first character typed within a line.

_____i. Advances the paper or cursor to the next line.

1. Break key
2. Control key
3. Escape key
4. Line feed key
5. Shift key
6. Return key
7. Rubout key (DELETE)
8. X-on key (CTRL-S)
9. X-off key (CTRL-Q)

4. List 5 procedures related to routine maintenance.

a.

b.

c.

d.

e.

ONLINE COMPUTER TERMINAL

INFORMATION SHEET

I. Terms and definitions

A. Baud rate--The number of characters transmitted per second in telecommunications. Common baud rates are 300, 1200, and 9600.

B. Cathode ray tube (CRT)--An electronic vacuum tube that displays output data on a screen by means of controlled electron beams. (TM 2)

C. Console--The array of controls that allows an operator or maintenance engineer to communicate with and manually introduce data into a computer.

D. Control number--An identification number assigned by the data clerk to any data entering the data processing department; the number is used to monitor the status of data as it is processed.

E. Demodulation--The reconversion of impulses at the end of telecommunications.

F. Hardcopy--Outputs that are produced in a printed, permanent, and readable format.

G. Logoff--A command to terminate communications with a time-sharing system.

H. Logon--A command to initiate communications with a time-sharing system.

I. Modem--Acronym for modular-demodulator, a device used to convert machine readable data into signals that can be transmitted over communication lines and facilities, and vice versa. (TM 1)

J. Modulation--The initial conversion of the impulses at the start of telecommunications.

K. Offline--The condition in which direct communication with a computer is not possible.

L. Online--The condition in which direct communication with a computer is possible.

M. Online processing--The processing performed by a computer in which data is directly transmitted between input and output devices.

N. Program package--A group of programs that completely satisfies and handles an entire computer application (i.e., a payroll package).

O. Remote job entry (RJE) station--A device which permits the telecommunication of data to and from a distant computer that can support the input of cards, the output of printed reports, and the use of terminals to input or output data. (TM 1)

P. Softcopy--Computer output which assumes a visual, non-permanent format.

Q. Software--All the programs, procedures, rules, peripheral data, and information concerned with the operation of a computer system.

R. Source document--A document from which information is removed to begin the processing of data.

S. Telecommunications--The transmission and processing of data via telephone lines and other high-speed communication means which support online processing.

T. Time-sharing--The simultaneous use of the resources of an online computer system by a group of individuals. (TM 1)

U. User--The recipient of computer services.

V. Verification of data--The process by which keyed data is checked for accuracy prior to input to the computer.

II. Components of a computer terminal

A. Terminal--A device equipped with a keyboard and some kind of display, capable of sending and receiving information. (TM 2)

1. Printing terminal-- This terminal consists of a typewriter placed next to the main console of a system. A device of this type allows communications between operator and system or system operator.

2. Visual display terminal (TM 2)-- The CRT is also referred to as a visual display terminal. The keyboard on this terminal is used to enter data. As the keys are struck, the entered information appears on the screen thus allowing the user of the terminal to check the input. Data received from the computer is output, its format having been dictated by the program.

B. Keyboard--A device for the manual encoding of data by depressing keys that cause the generation of the selected code element. The keyboard consists of the following special keys. (NOTE: Keys may vary from one piece of equipment to another). (TM 4)

1. Break key	6. Return key
2. Control key	7. Rubout key (DELETE)
3. Escape key	8. X-off key (CTRL-5)
4. Linefeed key	9. X-on key (CTRL-Q)
5. Shift key	

C. Acoustic coupler--The acoustic coupler is used as an interface between a telephone line and a terminal. Terminals equipped with this device, and the appropriate call control units, use ordinary telephone lines to gain access to the computer. The acoustic coupler holds the telephone headset, and is, in turn, wired to the terminal. The coupler converts data being sent between the terminal and computer into acoustic signals for transmission over telephone lines. The hookup between the coupler and telephone line is not permanent. (TM 3)

D. Data set-- A device that performs the appropriate modulation/demodulation and control functions necessary to provide compatibility between computing machines and communication facilities. The data set couples the terminal to telephone lines. It is wired directly to both the terminal and the telephone lines. (TM 3)

III. Functions of special keys on the keyboard (TM 4)

A. Break key (BREAK)--Terminates a program which is running, listing or punching; allows new information to be entered.

B. Control key (CTRL)--Used in conjunction with other keys to perform control functions.

C. Escape key (ESC)--Used in sequence with other keys to produce special functions.

D. Line Feed key (LINE FEED)--Advances the paper or cursor to the next line.

E. Shift key (SHIFT)--Hold down to use a character shown on the top half of a key.

F. Return key (RETURN)--Moves the printing head or cursor back to the left margin and advances to the next line.

G. Rubout key or (DELETE)--Eliminates or deletes the first character typed within a line.

H. X-off key or CRTRL-S--Stops transmission from host computer to terminal.

I. X-on key or CTRL-Q--When used with a computer, it allows the terminal to receive transmission from host computer.

IV. Routine maintenance procedures related to computer terminal operation

A. Inventory data processing supplies.

B. Load forms.

C. Make impression adjustments.

D. Change ribbons (if applicable).

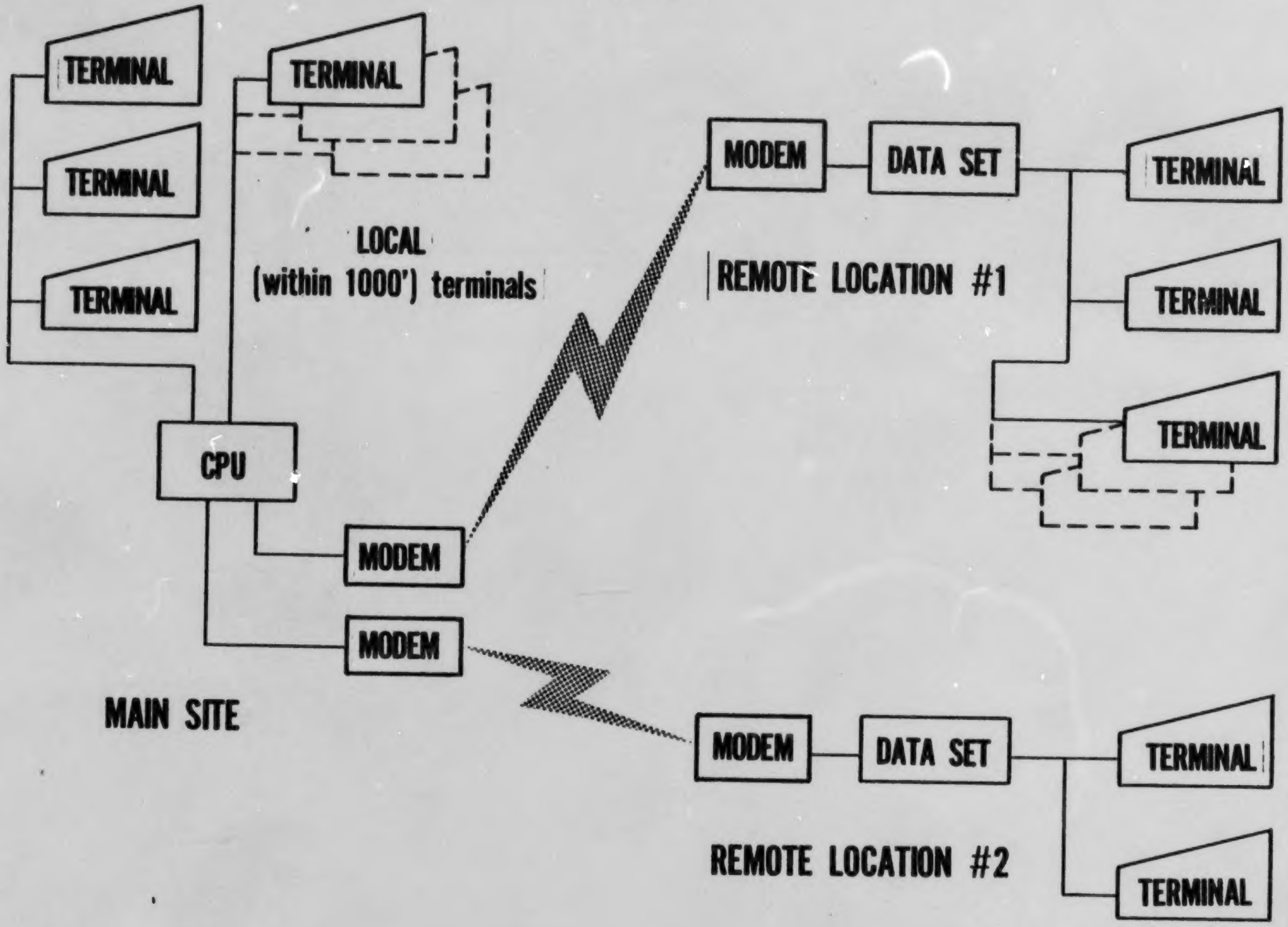
E. Clean cover and keyboard.

F. Clean CRT screen (if applicable).

G. Keep foreign objects away from terminal.

H. Clean work area of materials after use.

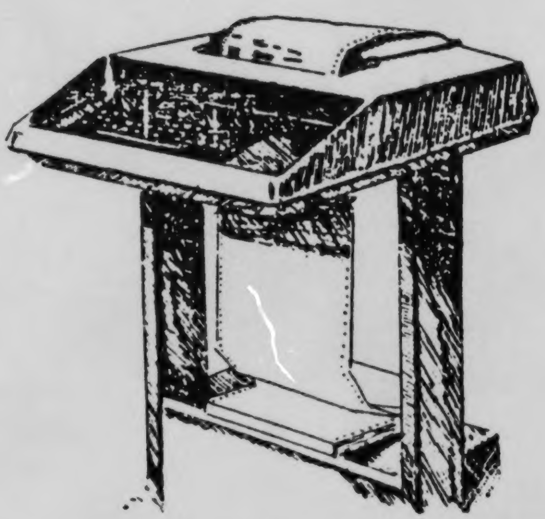
COMMUNICATIONS ENVIRONMENT
VIA CRT


TERMINAL
TERMINAL
TERMINAL
TERMINAL
LOCAL
(within 1000') terminals
CPU
MODEM
MODEM
MAIN SITE
MODEM
DATA SET
TERMINAL
REMOTE LOCATION #1
TERMINAL
TERMINAL
MODEM
DATA SET
TERMINAL
REMOTE LOCATION #2
TERMINAL

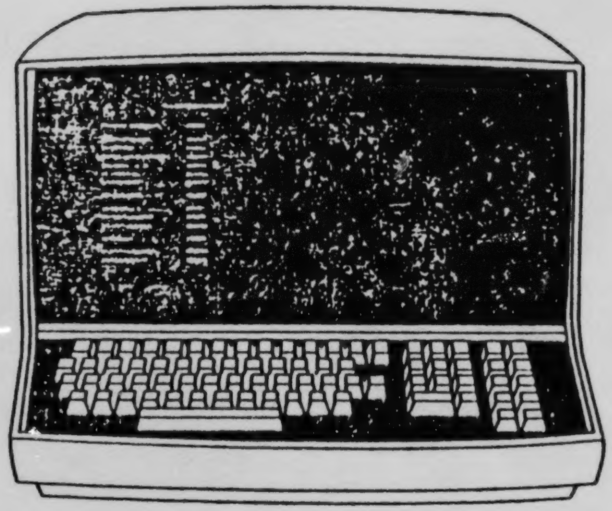
TM 1

OCT 11

THE TERMINAL



PRINTING TERMINAL



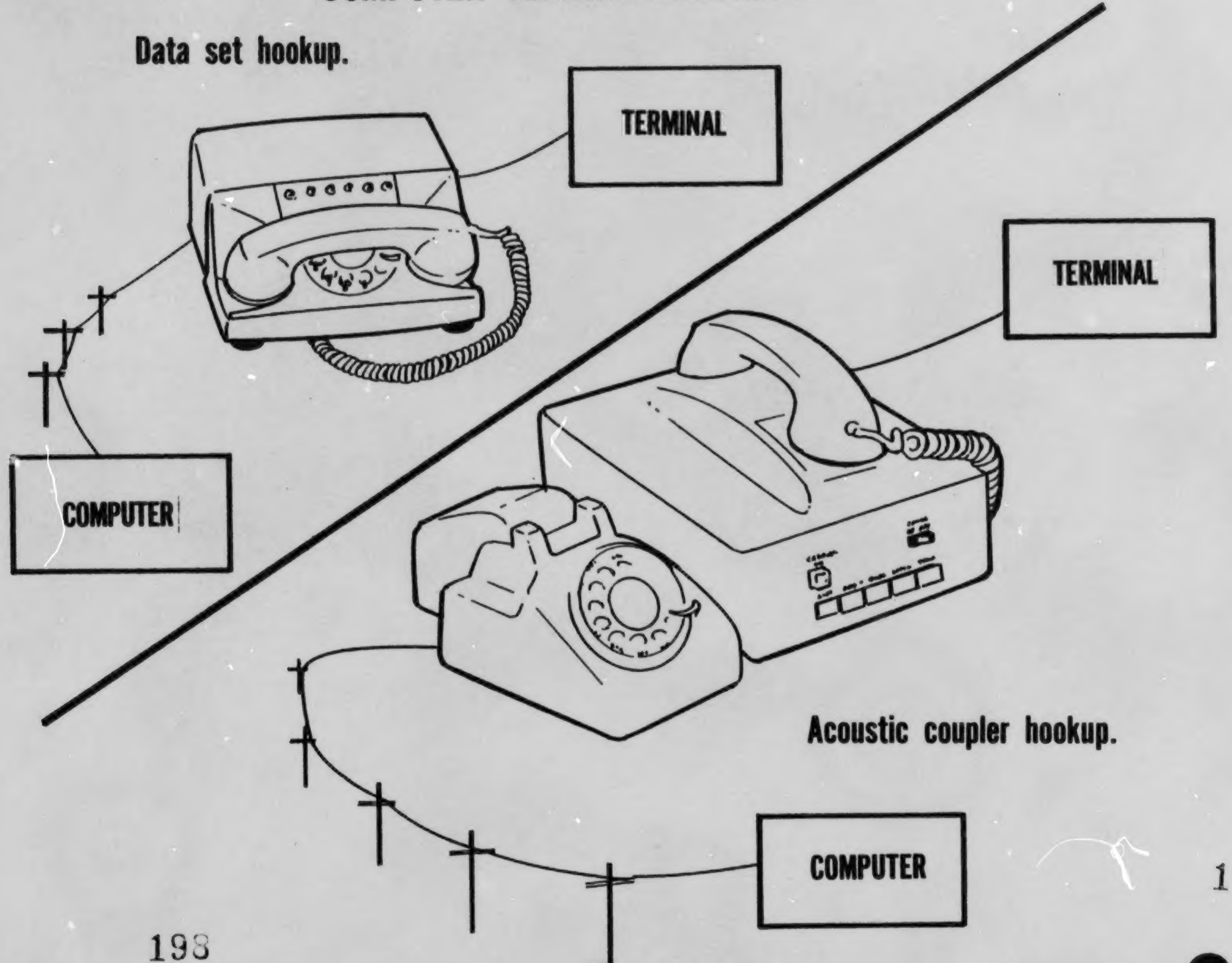
VIDEO DISPLAY
SCREEN TERMINAL

TM 2

OCT 12

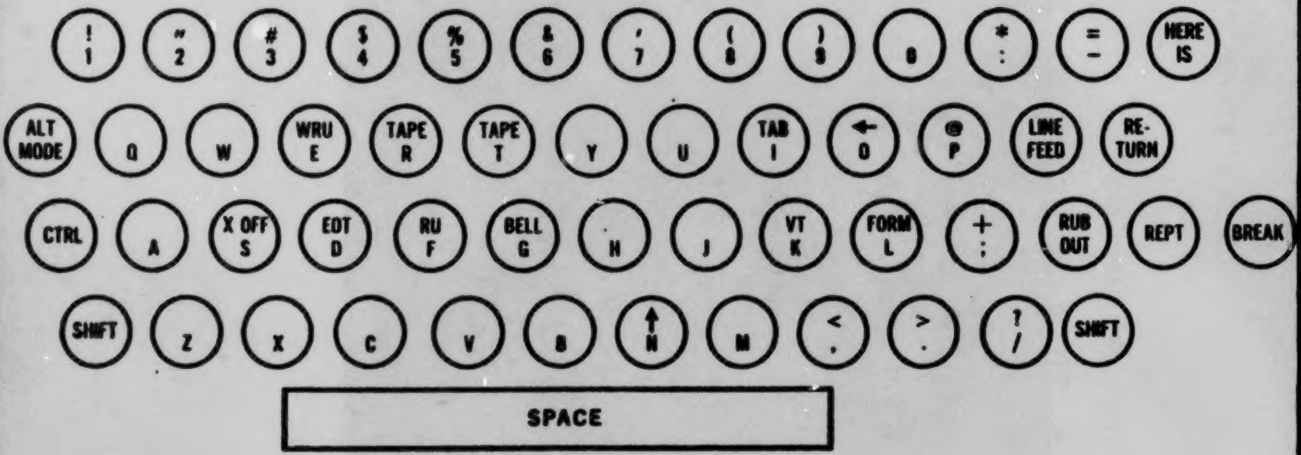
COMPUTER TERMINAL HOOKUPS

Data set hookup.


TERMINAL
COMPUTER
TERMINAL
COMPUTER

Acoustic coupler hookup.

TELETYPEWRITER KEYBOARD


! 1
" 2
# 3
$ 4
% 5
& 6
' 7
(8
) 9
0
* :
= -
HERE IS
ALT MODE
Q
W
WRU E
TAPE R
TAPE T
Y
U
TAB I
← O
@ P
LINE FEED
RE-TURN
CTRL
A
X OFF S
EOT D
RU F
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FORM L
+ ;
RUB OUT
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SHIFT
Z
X
C
V
B
↑ N
M
< ,
> .
? /
SHIFT
SPACE

ONLINE COMPUTER TERMINAL

JOB SHEET #1--OPERATE AN ONLINE COMPUTER TERMINAL

I. Tools and materials

   A. Online computer terminal

   B. Source documents

II. Procedure (May vary from machine to machine.)

   A. Power up terminal and acoustic coupler.

   B. Load paper into terminal (if applicable).

   C. Dial up host computer.

   D. Type in Logon sequence.

   E. Run appropriate applications program.

   F. Key information from source documents.

   G. Terminate online session.

   H. Power down terminal and acoustic coupler.

   I. Record your time in computer log.

   J. Clean working area before leaving.

ONLINE COMPUTER TERMINAL

JOB SHEET #2--OPERATE EQUIPMENT TO VERIFY WORK

I. Tools and materials

   A. Online computer terminal

   B. Original source documents

   C. Previously entered data

II. Procedure

   A. Power up terminal and acoustic coupler.

   B. Load paper into terminal (if applicable).

   C. Dial up host computer.

   D. Type in Logan sequence.

   E. Run appropriate applications program.

   F. Compare previously keyed information to source documents and perform necessary corrections.

   G. Terminate online session.

   H. Power down terminal and acoustic coupler.

   I. Record your time in computer log.

ONLINE COMPUTER TERMINAL

TEST

1. TRUE OR FALSE: Using "T" or "F", indicate if the following statements are true or false.

_____a. A program package completely satisfies and handles an entire computer application.

_____b. When the shift key is held down, the character on the top half of the key is used.

_____c. An acoustic coupler provides compatibility between computing machine and user.

_____d. Output, which is in a non-permanent format, is known as software.

_____e. The modem is used to initiate communication with a time-sharing system.

_____f. The control number is used to monitor the status of data as it is processed.

_____g. The escape key allows a program to be terminated so new information can be entered.

_____h. A data set performs the appropriate modulation/demodulation and control functions.

_____i. A user is the operator running the data processing equipment.

_____j. The simultaneous use of an online system is time-sharing.

2. MULTIPLE CHOICE: Circle the number to the correct answer.

a. The ___?___ is referred to as a visual display terminal because as keys are struck the entered information appears on the screen, allowing the entry operator to check the input.

1. RJE
2. BITS
3. terminal
4. CRT

b. The ___?___ allows an operator to communicate with a computer.

1. CRT
2. console
3. modem
4. terminal

c. The __?__ key allows the terminal to receive transmission from a host computer while the __?__ key stops transmission from a host computer.

1. shift, CTRL-S	3. CTRL-Q, CTRL-S
2. CTRL-Q, escape	4. X-on, X-off

d. The condition in which direct communication with a computer is not possible is called

1. offline.	3. online.
2. logoff.	4. logon.

e. __?__ processing is performed by a computer when data is directly transmitted between input and output devices.

1. Offline	3. Online
2. Logoff	4. Logon

f. Outputs that are produced in a printed, permanent, and readable format are

1. papercopy.	3. softcopy.
2. hardcopy.	4. software.

g. The reconversion of impulses at the end of telecommunications is known as

1. demodulation.	3. modem.
2. modulation.	4. demodem.

h. To eliminate the first character typed within a line, the data entry operator would use the __?__ key.

1. return	3. rubout
2. delete	4. escape

i. The process by which keyed data is checked for accuracy prior to input to the computer is called __?__ of data.

1. documentation	3. proofing
2. recording	4. verification

j. A __?__ permits the telecommunication of data to and from a distant computer.

1. RJE	3. BYTE
2. CRT	4. logon

3. TRUE STATEMENTS: Circle the letter of only the true statements.

The person responsible for routine maintenance performs the following procedures:

a. Cleans CRT screens, if applicable.

b. Inventories data processing supplies.

c. Calls vendors for any supplies.

d. Loads appropriate forms.

e. Places requisitions with purchasing for new equipment.

f. Cleans work area of materials after use.

g. Makes impression adjustments.

h. Schedules when major maintenance is to take place.

i. Cleans cover and keyboard.

j. Cleans the CRT screen, if applicable.

ONLINE COMPUTER TERMINAL

ANSWERS TO PRETEST

1.	a.	6	f.	18	k.	19	p.	20	u.	16
	b.	11	g.	8	l.	14	q.	7	v.	9
	c.	4	h.	15	m.	2	r.	12		
	d.	13	i.	22	n.	10	s.	3		
	e.	1	j.	5	o.	17	t.	21		
2.	a.	5	c.	1	e.	2				
	b.	4	d.	6	f.	3				
3.	a.	6	c.	9	e.	1	g.	3	i.	4
	b.	2	d.	5	f.	8	h.	7		

4. Answers may appear in any order and should be 5 of the following:

A. Inventory data processing supplies.
B. Load forms.
C. Make impression adjustments.
D. Clean cover and keyboard.
E. Clean CRT screen (if applicable).
F. Keep foreign objects away from terminal.
G. Change ribbons (if applicable).
H. Clean work area of materials after use.

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ONLINE COMPUTER TERMINAL

ANSWERS TO TEST

1. True or False.

   a. T
   b. T
   c. F
   d. F
   e. F
   f. T
   g. T
   h. T
   i. F
   j. T

2. Multiple Choice.

   a. 4
   b. 2
   c. 3 or 4
   d. 1
   e. 3
   f. 2
   g. 1
   h. 2 or 3
   i. 4
   j. 1

3. True Statements.

   a. T
   b. T
   c. F
   d. T
   e. F
   f. T
   g. T
   h. F
   i. T
   j. T

DATA ENTRY FORMATS

UNIT OBJECTIVE

After completion of this unit, the student should be able to analyze data entry formats and perform clerical activities related to this data processing job. This knowledge will be evidenced through demonstration and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to data entry formats to the correct definitions.
2. List types of program fields.
3. List steps to prepare data for entry.
4. Demonstrate the ability to:
    a. Key a program format.
    b. Test a program format.

PREREQUISITES

Online Computer Terminal

Offline Data Entry Devices

DATA ENTRY FORMATS

SUGGESTED ACTIVITIES

I. Instructor:
   - A. Give pretest.
   - B. Provide student with objective sheet.
   - C. Provide student with information and job sheets.
   - D. Discuss unit and specific objectives.
   - E. Discuss information and job sheets.
   - F. Work with students individually on equipment.
   - G. Give test.

II. Student:
   - A. Take pretest.
   - B. Read objective sheet.
   - C. Study information sheets.
   - D. Make sure you can operate equipment.
   - E. Complete job sheets.
   - F. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:
   - A. Objective sheet.
   - B. Information sheets.
   - C. Job sheets: #1 Key a Program Format.
     #2 Test a Program Format.
   - D. Pretest and test.
   - E. Answers to pretest and test.

II. References:

A. Dock, V. Thomas and Edward Essick. Principles of Business Data Processing. Science Research Associates, Inc., 1978.

B. Fuori, William M., Anthony D'Arco, and Lawrence Orilia. Introduction to Computer Operations. New York, NY: McGraw-Hill Book Company, Inc., 1973.

C. References available in your school.

DATA ENTRY FORMATS

PRETEST

1. Match the terms on the right to the correct definition.

    _____a. A method of operation.

    _____b. To rearrange data or information.

    _____c. When characters occupy the right-hand position of a field.

    _____d. A series of instructions which direct a data entry device to perform specific tasks automatically.

    _____e. An area of a record that is allocated for a specific category of data.

    _____f. When the characters occupy the left-hand position of a field.

    _____g. A letter or other symbol, excluding digits, used in a language.

    _____h. A predetermined arrangement of data.

    _____i. To reproduce data without altering the original data.

    _____j. Bypassing data areas on a record manually or automatically.

    _____k. A reference to numerals as opposed to letters or other symbols.

    _____l. A decimal position which is assumed to be in a specific location by the program.

    1. Alphabetic character
    2. Duplicate
    3. Edit
    4. Field
    5. Format
    6. Implied decimal
    7. Left justify
    8. Mode
    9. Numeric control
    10. Program control
    11. Right justify
    12. Skip

2. List 3 types of program fields.

a.

b.

c.

3. List 3 steps in preparing data for entry.

a.

b.

c.

DATA ENTRY FORMATS

INFORMATION SHEET

I. Terms and definitions

A. Alphabetic character--A letter or other symbol, excluding digits, used in a language; the letters A thru Z and special characters.

B. Duplicate--To reproduce data without altering the original data.

C. Edit--To rearrange data or information; to adjust the form or format.

D. Field--An area of a record that is allocated for a specific category of data; for example, a group of positions used to represent a wage rate or a location that contains certain information like last name or first name.

E. Format--A predetermined arrangement of data, e.g., characters, fields, lines, punctuation, page numbers, etc.

F. Implied decimal--A decimal position which is assumed to be in a specific location by the program. It is not actually punched. Likewise, other special characters such as the dollar sign, comma, semi-colon, etc. are not punched.

G. Left justify--When the characters occupy the left-hand position of a field. Alphabetic and alphanumeric data is generally left justified and filled to the right with blanks.

H. Mode--A method of operation, e.g., the binary mode, alphabetic mode, numeric mode, etc.

I. Numeric character--A reference to numerals as opposed to letters or other symbols.

J. Program control--A series of instructions which direct a data entry device to perform specific tasks automatically.

K. Right justify--When the characters occupy the right-hand position of a field. Numeric data is generally right justified and filled to the left with zeros.

L. Skip--Bypassing data areas on a record manually or automatically.

II. Types of program fields

- A. Alphabetic
- B. Numeric
- C. Alphanumeric
- D. Skip (if applicable)
- E. Duplication (if applicable)

III. Steps to prepare data for entry

- A. Organize source documents to correspond with input requirements (alphabetically, numerically, sequentially, etc.).
- B. Retrieve media that corresponds to the job to be keyed (if applicable).
- C. Select a format which will layout appropriate fields for data to be entered.

DATA ENTRY FORMATS

JOB SHEET #1--KEY A PROGRAM FORMAT

I. Tool and materials

   A. Data entry machine.

   B. Source document (see DEF 9).

   C. A designed program format (determined by instructor).

   D. Program medium.

II. Procedure

   A. Power up data entry equipment.

   B. Logon (if applicable).

   C. Load program media (if applicable).

   D. Select and display program format (if applicable).

   E. Key program on to medium (if applicable).

   F. Remove and file media from entry equipment (if applicable).

   G. Logoff (if applicable).

   H. Power down equipment.

   I. Clean work area before leaving.

DATA ENTRY FORMATS

JOB SHEET #1--OPERATIONS DATA

Dept.	Shift	Emp. No.	Name	Date
14	1	349	Sullivan ⑨	6/27

Work Order Number	Elap. Time	Part Number	SC No.	Production Number
36592	1.0	231-519-19776-339	4865	59-2226
80063	1.0	100-240-59111-250	7932	36-8299
42975	1.0	949-255-60475-518	6875	61-7763
26519	1.0	651-273-18793-321	1899	25-3888
8726	.5	290-326-58071-691	2364	94-9365
19342	1.5	827-133-11161-584	7844	86-7288
52987	1.0	441-076-25981-411	7811	59-4297
60019	1.0	829-651-77511-431	1029	28-8904

Dept.	Shift	Emp. No.	Name	Date
2	2	2255	Johnson ⑩	4/1

Work Order Number	Elap. Time	Part Number	SC No.	Production Number
27853	1.0	536-295-16037-331	9781	44-4733
10066	1.0	216-465-98011-535	5632	52-8001
32987	2.0	101-915-15241-291	7012	96-7220
15679	.8	862-565-77283-221	6210	61-3244
30075	1.2	219-738-15881-622	6012	75-9887
69211	1.0	377-591-61141-611	5936	46-1154
78777	.5	201-211-74892-181	4611	93-2541
98322	.5	534-061-42880-411	8239	75-4816

DATA ENTRY FORMATS

JOB SHEET #2--TEST A PROGRAM FORMAT

I. Tools and materials

   A. Data entry machine.

   B. A designed program format.

   C. Program medium.

   D. Sample source document. (Refer to Job Sheet #1)

II. Procedure

   A. Power up data entry equipment.

   B. Logon (if applicable).

   C. Load program media (if applicable).

   D. Select and display program format (if applicable).

   E. Key program on to medium (if applicable).

   F. Load formatted program.

   G. Key data from sample source document.

   H. Verify that the data has been correctly entered on to medium or into file.

   I. If in error, make corrections to alter program format.

   J. Remove and file media from entry equipment (if applicable).

   K. Logoff (if applicable).

   L. Power down equipment.

   M. Clean work area before leaving.

DATA ENTRY FORMATS

TEST

TRUE OR FALSE: Using "T" or "F", indicate if the following statements are true or false.

_____a. When one is preparing data for entry, it is important to select a form which will layout appropriate fields for data to be entered.

_____b. Alphabetic and numeric are types of formats used on diskettes.

_____c. A series of instruction which directs a data entry device to perform a specific task is known as a flowchart.

_____d. When a format is edited, rearrangement of data takes place.

_____e. An area of a record that is allocated for a specific category of data is called a field.

_____f. Numeric data is generally right justified.

_____g. A field is a predetermined order of data.

_____h. An alphabetic mode or binary mode is a method of operation.

_____i. Alphabetic characters include letters from A thru Z, all sorts of symbols, and digits 0 thru 9.

_____j. Organizing source documents to correspond with input requirements is the first step in documentation.

_____k. If the decimal is implied, then other special characters need not be punched.

_____l. Alphabetic and alphanumeric data is usually left justified and filled to the right with zeros or dashes.

DATA ENTRY FORMATS

ANSWERS TO PRETEST

1. a. 8
   b. 3
   c. 11
   d. 10
   e. 4
   f. 7
   g. 1
   h. 5
   i. 2
   j. 12
   k. 9
   l. 6

2. Answers may be any 3 of the following:
   a. Alphabetic
   b. Numeric
   c. Alphanumeric
   d. Skip
   e. Duplication

3. Answers may appear in any order.
   a. Organize source documents to correspond with input requirement.
   b. Retrieve media that corresponds to job to be keyed.
   c. Select a format which will lay out appropriate fields for data to be entered.

DATA ENTRY FORMATS

ANSWERS TO TEST

1. True or False.

   a. T
   b. F
   c. F
   d. T
   e. T
   f. T
   g. F
   h. T
   i. F
   j. F
   k. T
   l. F

COMPUTER OPERATION

UNIT OBJECTIVE

After completion of this unit, the student should have an understanding of the basic concepts necessary to operate a computer and be able to operate one. This knowledge will be evidenced through assignments, demonstration, and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to computer operation to the correct definitions.
2. Match the components of a computer system to their correct function.
3. List types of peripheral equipment.
4. Describe the procedure to be followed in operating a computer.
5. Demonstrate the ability to run a program on a computer.

PREREQUISITES

Common Features of Data Processing System

Online Computer Terminal

Offline Data Entry Devices

COMPUTER OPERATION

SUGGESTED ACTIVITIES

I. Instructor:

   A. Give pretest.

   B. Provide student with objective sheet.

   C. Provide student with information, assignment and job sheets.

   D. Make transparency.

   E. Discuss unit and specific objectives.

   F. Discuss information sheets.

   G. Discuss assignment and job sheets.

   H. Invite a computer operator to talk with students.

   I. In small groups, have students observe and assist a computer operator.

   J. Give test.

II. Student:

   A. Take pretest.

   B. Read objective sheet.

   C. Study information sheets.

   D. Complete assignment sheets and job sheets.

   E. Be able to identify and explain the use of computer system components.

   F. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

   A. Objective sheet.

   B. Information sheets.

C. Transparency masters: TM 1 - Computer Log.

TM 1-2 - Explanation of Computer Log.

TM 2 - Components of a Computer.

D. Assignment sheet #1--Observation of a Computer System.

E. Job sheet #1--Running a Program.

F. Pretest and test

G. Answers to pretest and test.

II. References

A. Carver, D. K. *Introduction to Business Data Processing.* New York: John Wiley & Sons, Inc., 1979.

B. Couger, J. Daniel and Fred R. McFadden. *A First Course in Data Processing*. Santa Barbara: Wiley/Hamilton Publication, 1977.

C. DeRossi, Claude J. *Exploring the World of Data Processing.* Reston, Virginia: Reston Publishing Company, Inc., 1975.

D. Dock, V. Thomas and Edward Essick. *Principles of Business Data Processing.* Science Research Associates, 1978.

E. Orilia, Lawrence S. *Introduction to Business Data Processing.* New York: McGraw-Hill Book Company, 1979.

F. Squire, Enid. *The Computer An Everyday Machine.* Ontario, Canada: Addison-Wesley Ltd., 1972.

G. Wu, Margaret S. *Introduction to Computer Data Processing*, second edition. New York: Harcourt Brace Jovanovich, Inc., 1979.

H. Manufacturer operating manuals.

I. References available in your school.

COMPUTER OPERATION

PRETEST

1. Match the terms on the right to the correct definition.

_____ a. A program supplied by the manufacturer; used to supervise the operation of programs during execution.

_____ b. A general term for the equipment used to communicate with a computer and the data involved in the communication.

_____ c. The set of instructions by which a computer operates to accomplish a specific task.

_____ d. A standard routine normally made available by the computer manufacturer as part of the software package.

_____ e. The part of a computer system containing the systems arithmetic/logic, and control functions.

_____ f. Information supplied by the vendor on the specific operation of a particular computer or piece of the software.

_____ g. A unit of equipment capable of reading information from a magnetic disk pack and transferring it to main storage.

_____ h. An output device that produces a permanent hard copy in the form of characters and symbols on paper or stock.

_____ i. The transmission and processing of data via telephone lines and other high-speed communication means which support online processing.

_____ j. An input device that reads information on punch cards and transmits it to main computer storage.

_____ k. To write out data from high speed memory concurrently with job execution.

1. Batch processing
2. Card reader
3. Central processing unit
4. Compiler
5. Computer log
6. Console
7. Diagnostic
8. Disk drive
9. Error message
10. Input/Output device (I/O)
11. Mass storage device
12. Monitor
13. Multiprogramming
14. Online
15. Operating system
16. Operation manual
17. Peripheral equipment
18. Plotter
19. Printer
20. Program
21. Spool out

_____l. A term referring to the discovery and isolation of an error in a program or a malfunction in the equipment.

_____m. A device used in conjunction with the computer to represent data in graphic form.

_____n. A piece of equipment that contains a tape drive, reading and writing heads, and the necessary controls required for reading and writing data on magnetic tape.

_____o. The part of the system that contains a variety of entry and display devices which allow the operator to control, communicate, and monitor the operation of the computer, and from which any requirement for attention is normally made evident.

_____p. Any unit of equipment used in conjunction with a computing system that is not an integral part of the central processing unit of the computer itself.

_____q. Information printed out by the computer which indicates some need for attention by the programmer or operator.

_____r. A mechanism that transports paper or magnetic tape past a read/write head.

_____s. An integrated collection of computer programs for supervising and operating the application programs for a computer.

_____t. A large-capacity storage whose contents are readily accessible to the central processing unit of a computer.

_____u. The program which causes a computer to translate high-level programs into machine-language programs.

_____v. Enables a more efficient use of the computer by allowing concurrent execution of two or more programs held in the main storage of the CPU.

22. Tape drive

23. Tape unit

24. Telecommunications

25. Time-sharing

26. Utility routine

_____w. Records the activities of the computer.

_____x. A data processing system which collects data over a period of time and then processes the data at a scheduled time.

_____y. To be directly connected to the system jobs. The format of this listing varies between companies.

_____z. A data processing system which permits many users to use the system at the same time.

2. Match the components of a computer listed on the right to their correct functions.

_____a. Directs and coordinates the entire computer system.

_____b. A device which displays, prints, or otherwise makes information available to people.

_____c. Adds, substracts, multiplies, and divides.

_____d. Houses the CPU and main computer storage.

_____e. Presents data to the processor unit of the computer.

1. Unit
2. Control unit
3. Input unit
4. Processor unit
5. Output unit

3. List 4 types of peripheral equipment.

a.

c.

b.

d.

4. Describe the procedure to be followed in operating a computer. (Depth of answer will be determined by the instructor).

COMPUTER OPERATION

INFORMATION SHEET

I. Terms and definitions

A. Batch processing--A data processing system which collects data over a period of time and then processes the data at a scheduled time.

B. Card reader--An input device that reads information on punch cards and transmits it to main computer storage.

C. Central processing unit (CPU)--The part of a computer system containing the systems arithmetic/logic and control functions.

D. Compiler--The program which causes a computer to translate higher-level programs into machine language programs.

E. Computer log--Records the activities of the computer. The format will vary from company to company. The log is kept within easy reach of the operator, thus allowing every activity of the system to be identified and recorded. (TM 1, TM 1-2)

F. Console--Part of the system that contains a variety of entry and display devices which allow the operator to control, communicate, and monitor the operation of the computer, and from which any requirement for attention is normally made evident.

G. Diagnostic--A term referring to the discovery and isolation of an error in a program or a malfunction in the equipment.

H. Disk drive--A direct access device that reads and records data magnetically on rotating disks.

I. Error message--Information printed out by the computer which indicates some need for attention by the programmer or operator.

J. Input/output devices (I/O)--A general term for the equipment used to communicate with a computer and the data involved in the communication.

K. Mass storage devices--A large-capacity storage whose contents are readily accessible to the central processing unit of a computer.

L. Monitor--A program supplied by the manufacturer; used to supervise the operation of programs during execution.

M. Multiprogramming--Enables a more efficient use of the computer by allowing concurrent execution of two or more programs held in the main storage of the CPU.

N. Online--To be directly connected to the system jobs. The format of this listing varies between companies.

O. Operating system (O.S.)--An integrated collection of computer programs for supervising and operating the application programs for a computer.

P. Operation manual--Information supplied by the vendor on the specific operation of a particular computer or piece of software.

Q. Peripheral equipment--Any unit of equipment used in conjunction with a computing system that is not an integral part of the central processing unit of the computer itself.

R. Plotter--A device used in conjunction with the computer to represent data in graphic form.

S. Program--A series of instructions which directs the computer to perform a sequence of tasks that produce a desired result.

T. Printer--An output device that produces a permanent hard copy in the form of characters and symbols on paper or stock.

U. Spool out--To write out data from high speed memory concurrently with job execution.

V. Tape drive--A mechanism that transports paper or magnetic tape past a read/write head; also known as tape transport.

W. Tape Unit--A piece of equipment that contains a tape drive, reading and writing heads, and the necessary controls required for reading and writing data on magnetic tape.

X. Telecommunications--The transmission and processing of data via telephone lines and other high-speed communication means which support online processing.

Y. Time-sharing--A data processing system which permits many users to use the system at the same time.

Z. Utility routine--A standard routine normally made available by the computer manufacturer as part of the software package.

II. Components of a computer (TM 2)

A. Central Processing Unit (CPU)--The CPU is the heart of the computer system. It interprets the instructions in a computer program, performs the calculations and the moving of data as specified by the program, and controls the input/output operations of the system. The CPU is one part of the processor unit of a system; the second part being the main computer storage. Data to be processed is stored in the main computer storage and is then referenced by the CPU so that processing can occur. The CPU consists of the arithmetic/logic unit and the control unit.

B. Arithmetic/logic unit--Uses "built-in" operations to perform arithmetic operations such as addition, subtraction, multiplication, and division. It can also perform logical operations such as comparing one number to another and indicating the results of the comparison.

C. Control unit--Directs and coordinates the entire computer system which includes controlling the input/output units, controlling the operations of the arithmetic/logic unit, and transferring data to and from the main computer storage.

D. Input unit--Presents data to the processor unit of the computer system for the processing of the data. This data is put on some type of media (tape, cards, disk, etc.) in machine-readable format.

E. Output unit--A device which displays, prints, or otherwise makes information available to people. Two popular forms of output are the printed report and the CRT terminal.

III. Peripheral equipment

A. Tape drive

B. Disk drive

C. Card read/punch

D. Printer

E. Terminal

F. Plotter

IV. Procedure in operating a computer

A. Activate system devices

a. Power up CPU and related peripheral equipment.

b. Load appropriate media into peripheral devices.

c. Ready disk drives, tape units, card readers, printers, etc.

B. Communicate with the computer through the console

a. Enter commands to display system activity level and peripheral equipment status.

b. Interpret system messages and diagnostics.

c. Take corrective action on system errors.

C. Initiate steps to correct I/O errors

   a. Correct malfunctions on specific peripheral device.

   b. Restart I/O by restoring equipment to ready status and entering commands into console.

   c. Restart job to recover lost I/O.

D. Identify and interpret machine malfunctions and error messages

   a. Understand system, run time, error codes, and messages.

   b. From system error indicators, locate specific device which has caused the error.

   c. Take appropriate action to restore device.

E. Load programs

   a. Enter media needed for job into appropriate peripheral devices.

   b. Initiate job run from console with necessary peripheral devices ready.

F. Check job status and observe for abnormal termination of job

   a. Check console display for job status.

   b. Observe peripheral devices for activity related to job.

   c. Look for job complete messages or normal completion of output from this job.

G. Check output to determine if job is complete

   a. Scan printed output and console display for end of job indicators.

   b. Check console for completion of processing and peripheral devices for completion of any spool out.

H. Remove output from machine

   a. Remove printed output from printers, terminals, plotters, etc.

   b. Remove media from disk drives, tape drives, and card devices.

I. Utilize operator's manual

   a. Reference system manual for specific operational procedures.

   b. By reading manuals, become familiar with overall operating system design.

- c. Utilize operational procedures that will optimize or facilitate system performance.

J. Maintain operational status reports

- a. Enter completed job runs in daily activity log.
- b. Record system errors and equipment malfunctions in trouble log.

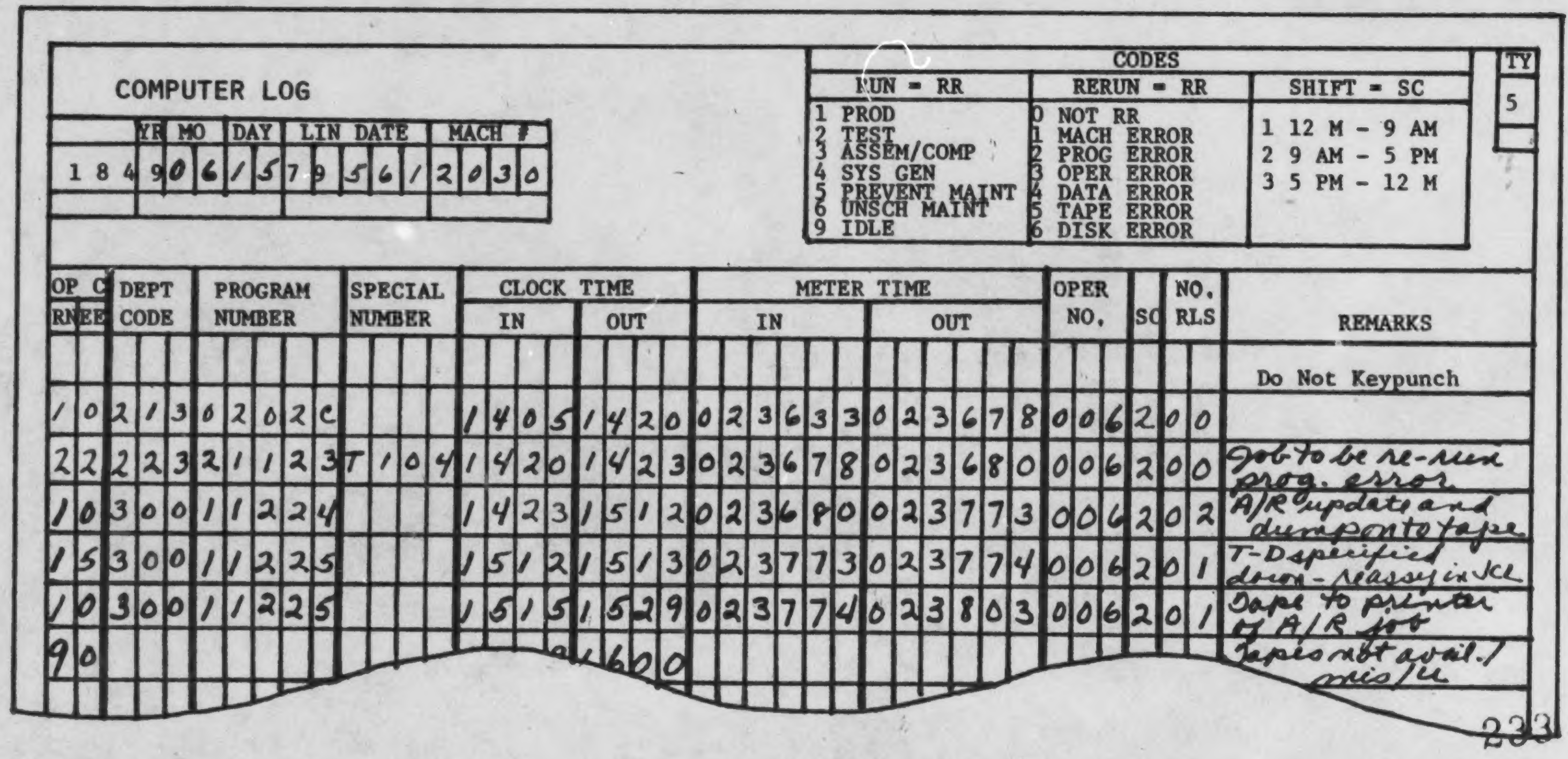
K. Monitor telecommunications equipment

- a. Activate and monitor remote line equipment.
- b. Use system console to display line activity.
- c. Take corrective action on lines which indicate high data error rates.

L. Execute specific operator utilities

- a. Use system utilities to back up media, print activity reports, and correct system problems.
- b. Run system diagnostic tests to produce maintenance reports for field service.

COMPUTER LOG



COMPUTER LOG

	YR	MO	DAY	LIN DATE	MACH #
1 8 4	9	0 6	1 5	7 9 5 6 1	2 0 3 0

CODES

RUN = RR	RERUN = RR	SHIFT = SC
1 PROD	0 NOT RR	1 12 M - 9 AM
2 TEST	1 MACH ERROR	2 9 AM - 5 PM
3 ASSEM/COMP	2 PROG ERROR	3 5 PM - 12 M
4 SYS GEN	3 OPER ERROR	
5 PREVENT MAINT	4 DATA ERROR	
6 UNSCH MAINT	5 TAPE ERROR	
9 IDLE	6 DISK ERROR	

TY 5

OP RN	C EE	DEPT CODE	PROGRAM NUMBER	SPECIAL NUMBER	CLOCK TIME IN	CLOCK TIME OUT	METER TIME IN	METER TIME OUT	OPER NO.	SC	NO. RLS	REMARKS
												Do Not Keypunch
1	0	213	0202C		1405	1420	023633	023678	006	2	00	
2	2	223	21123	T104	1420	1423	023678	023680	006	2	00	Job to be re-run prog. error.
1	0	300	11224		1423	1512	023680	023773	006	2	02	A/R update and dump onto tape
1	5	300	11225		1512	1513	023773	023774	006	2	01	T-D specified down - reassy in KL
1	0	300	11225		1515	1529	023774	023803	006	2	01	Tape to printer of A/R job
9	0					1600						Tapes not avail. / mis/KL

233

TM 1

232

CO 12

EXPLANATION OF TM 1

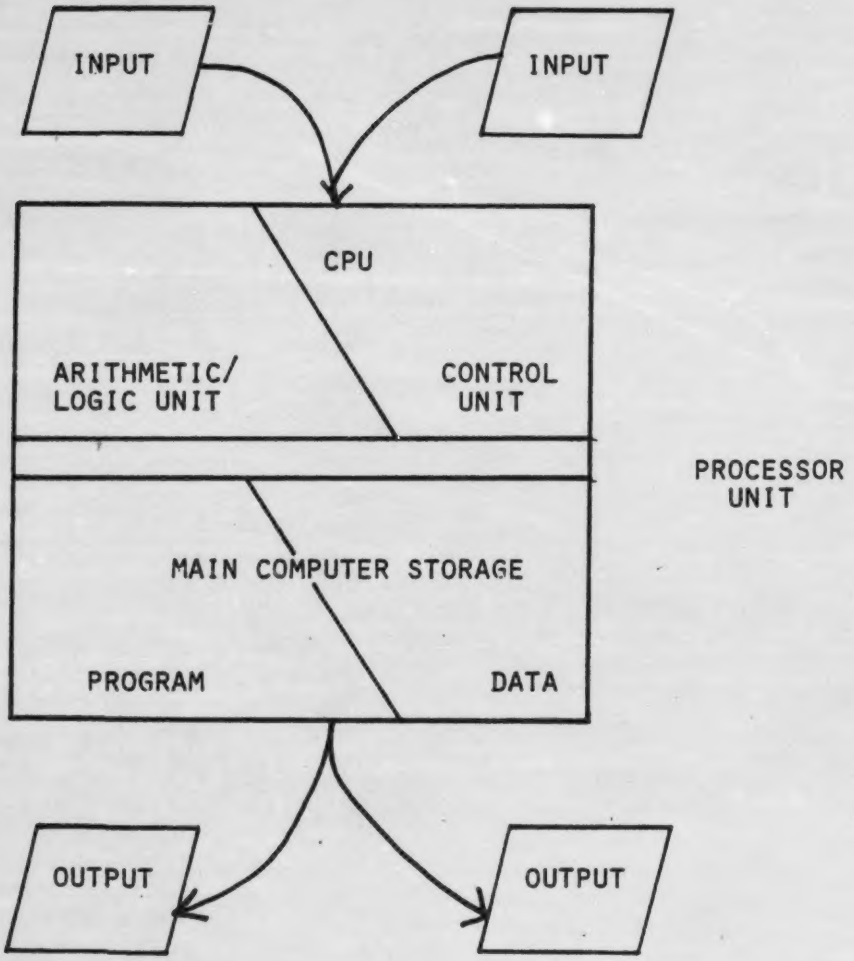
1. THE JOB WAS RUN ON JUNE 15, 1979. THE ENTRIES ARE 0615 FOR MONTH/DAY AND 561 FOR THE LINEAR DATE.

2. THE MACHINE NUMBER IS 2030, INDICATING AN IBM 360 SERIES MODEL 30.

3. OPERATOR 006 WAS ON THE 2 SHIFT.

4. JOBS 1 AND 3 WERE RUN WITHOUT INCIDENT; JOB 2 WAS A TEST RUN THAT WAS NOT PROCESSED DUE TO A PROGRAM ERROR; AND JOB 4 WAS INTERRUPTED AND HAD TO BE RERUN.

COMPONENTS OF A COMPUTER


INPUT
INPUT
CPU
ARITHMETIC/ LOGIC UNIT
CONTROL UNIT
PROCESSOR UNIT
MAIN COMPUTER STORAGE
PROGRAM
DATA
OUTPUT
OUTPUT

COMPUTER OPERATION

ASSIGNMENT SHEET #1--OBSERVATION OF A COMPUTER SYSTEM

Complete the following information by visiting a computer system in operation and talking with the operator.

Manufacturer of Computer____

Number of years the system has been in operation____________________

Types of input devices____

Describe the console____

Did the computer print out any error messages while you were present?________

If yes, describe the error messages__________________________________

____

Describe any logs or written description of the computer's use____________

____

____

Did you see any operations manuals?__________________________________

If yes, describe the use of these manuals during your visit________________

____

ADDITIONAL COMMENTS:

COMPUTER OPERATION

JOB SHEET #1--RUNNING A PROGRAM

Under the supervision of an operator or your instructor, load and run a program.

I. Equipment and materials

1. Computer system
2. Program on appropriate media
3. Data necessary to execute program (if applicable)

II. Procedure

1. Power up system (if necessary).
2. Load appropriate media into peripheral devices.
3. Ready needed peripheral devices.
4. Load operating system (if necessary).
5. Load and run program as instructed.
6. During job execution:
   a. Use system console to display job status.
   b. Use system manuals to interpret console display.
   c. Monitor I/O operations of job.
   d. Take action on any run time errors after notifying your instructor.
7. After completion of job:
   a. Remove output from printer, terminals, etc.
   b. Remove media from I/O devices.
   c. Power down system (if necessary).
   d. Clean work area before leaving.

COMPUTER OPERATION

TEST

1. TRUE OR FALSE: Using "T" or "F", indicate if the following statements are true or false.

_____a. The control unit directs the operation of all components in the computer.

_____b. A plotter plans the execution of program commands.

_____c. The computer operator corrects malfunctions on a specific peripheral device.

_____d. The CPU contains the systems arithmetic/logic and control functions.

_____e. A utility routine is a procedure the operator follows when maintaining the system.

_____f. Multiprocessing enables more efficient use of the computer.

_____g. Telecommunications support online processing.

_____h. Activating the system devices means powering up the CPU and related peripheral equipment.

_____i. By reading operator manuals, the operator becomes familiar with the overall operating system design.

_____j. A card reader prints information punched on a card.

2. MULTIPLE CHOICE: Circle the number of the correct answer.

a. A term referring to the discovery and isolation of an error in a program is

1. monitor.
2. diagnostic.
3. compiler.
4. disk drive.

b. Information supplied by the vendor pertaining to the operation of a piece of equipment is known as a/an

1. operation system.
2. console.
3. monitor.
4. operation manual.

c. ___?___ units are capable of reading information recorded on different media.

1. Memory
2. Input
3. Tape
4. Output

d. ___?___ is any unit of equipment used in conjunction with a computing system that is not an integral part of the CPU.

1. Tape drive
2. Operating system
3. Peripheral equipment
4. Disk drive

e. To write out data from high speed memory concurrently with job execution is to

1. spool out.
2. pour out.
3. read out
4. make out.

f. The ___?___ causes a computer to translate higher-level programs into machine language programs.

1. card reader
2. console
3. compiler
4. printer

g. The ___?___ unit can transfer or copy the contents of certain memory locations onto some external medium.

1. output
2. input
3. memory
4. CPU

h. A program supplied by the manufacturer to supervise the operation of programs during execution is called the

1. mass storage device.
2. console.
3. CPU.
4. monitor.

3. TRUE STATEMENTS: Circle the letters of all the true statements.

The following procedures are related to the operating of a computer:

a. Identify and interpret machine malfunctions and error messages.

b. Develop a flowchart for solving problems.

c. Remove output from printers, terminals, plotters, etc.

d. Monitor telecommunications equipment.

e. Develop JCL for each run.

f. Confer with users of the program

g. Run system diagnostic tests to produce maintenance reports.

h. Check console display for job status.

i. Develop user manuals.

j. Decide what hardware or software the company should purchase.

COMPUTER OPERATION

ANSWERS TO PRETEST

1. a. 12
b. 10
c. 20
d. 26
e. 3
f. 16
g. 8
h. 19
i. 24
j. 2
k. 22
l. 7
m. 18
n. 23
o. 6
p. 17
q. 9
r. 22
s. 15
t. 11
u. 4
v. 13
w. 5
x. 1
y. 14
z. 25

2. a. 2
b. 5
c. 1
d. 4
e. 3

3. Answers may appear in any order and should include four of the following:

a. Tape drive
b. Disk drive
c. Card read/punch
d. Printer
e. Terminal
f. Plotter

4. Answers should cover as many of the following:

a. Activate system devices.
b. Communicate with the computer through the console.
c. Initiate steps to correct I/O errors.
d. Identify and interpret machine malfunctions and error messages.
e. Load programs.
f. Check job status and observe for abnormal termination of job.
g. Check output to determine if job is complete.
h. Remove output from machine.
i. Utilize operator's manual.
j. Maintain operational status reports.
k. Monitor telecommunications equipment.
l. Execute specific operator utilities.

COMPUTER OPERATION

ANSWERS TO TEST

1. True or False.

   a. T
   b. F
   c. T
   d. T
   e. F
   f. T
   g. T
   h. T
   i. T
   j. F

2. Multiple Choice.

   a. 2
   b. 4
   c. 2
   d. 3
   e. 1
   f. 3
   g. 1
   h. 4

3. True Statements.

   a. T
   b. F
   c. T
   d. T
   e. F
   f. F
   g. T
   h. T
   i. F
   j. F

PREPARING JOBS FOR EXECUTION

UNIT OBJECTIVE

After completion of this unit, the student should be able to prepare a job for execution. This knowledge will be evidenced through demonstration and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to job execution to the correct definitions.
2. List types of jobs to be run.
3. List conditions to be considered in scheduling peripheral equipment.
4. List steps in running a job.
5. List job control parameters.
6. Demonstrate the ability to select and load forms needed for a job.

PREREQUISITES

Computer Operations

PREPARING JOBS FOR EXECUTION

SUGGESTED ACTIVITIES

I. Instructor:

  A. Give pretest.

  B. Provide student with objective sheet.

  C. Provide student with information, assignment and job sheets.

  D. Discuss unit and specific objectives.

  E. Discuss information, assignment, and job sheets.

  F. Information Sheet--Types of jobs to be run. Instructor should go into detail on each type of job.

  G. Assignment Sheet #2-- Use to generate class or small group discussion.

  H. Job Sheet #1--Have appropriate media and forms available to complete this job sheet.

  I. Give test.

II. Student:

  A. Take pretest.

  B. Read objective sheet.

  C. Study information sheets.

  D. Complete assignment and job sheets.

  E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet.

  B. Information sheets.

  C. Assignment sheets: #1 - Categorizing the Job

  #2 - Scheduling the Job

D. Job Sheet #1--Select and Load Forms for a Job.

E. Answers to assignment sheets.

F. Pretest and test.

G. Answers to pretest and test.

II. References

A. Carver, D. K. Introduction to Business Data Processing. New York: John Wiley & Sons, Inc., 1979.

B. Couger, J. Daniel and Fred R. McFadden. A First Course in Data Processing. Santa Barbara: Wiley/Hamilton Publication, 1977.

C. DeRossi, Claude J. Exploring the World of Data Processing. Reston, Virginia: Reston Publishing Company, Inc., 1975.

D. Dock, V. Thomas and Edward Essick. Principles of Business Data Processing. Science Research Associates, 1978.

E. Orilia, Lawrence S. Introduction to Business Data Processing. New York: McGraw-Hill Book Company, 1979.

F. Wu, Margaret S. Introduction to Computer Data Processing, second edition. New York: Harcourt Brace Jovanovich, Inc., 1979.

G. Manufacturer operating manuals.

H. References available in your school.

PREPARING JOBS FOR EXECUTION

PRETEST

1. Match the terms to the correct definition.

_____a. Any unit of equipment used in conjunction with a computing system that is not an integral part of the central processing unit of the computer.

_____b. An area of main internal storage reserved for data that is actually being processed or in some intermediate state of computation.

_____c. A job wherein there is interaction between users and the computer via telecommunication or local terminals.

_____d. A collection of records that designate and define a unit of work for the computer to perform.

_____e. The reading and writing of input and output data records on auxiliary storage devices.

_____f. To position accurately preprinted forms in the printer.

_____g. The portion of a single unit of external storage that can be read or written by a single reading or writing mechanism.

_____h. A condition where job execution is in an idle state waiting for the input or output devices to complete the transfer of data.

1. Alignment
2. Control records
3. Interactive job
4. I/O bound
5. Peripheral equipment
6. Spooling
7. Volumes
8. Working storage

2. List 4 types of jobs to be run.

a.

b.

c.

d.

3. List 3 conditions to be considered when scheduling peripheral equipment.

a.

b.

c.

4. List 5 steps in running a job, showing logical order.

a.

b.

c.

d.

e.

5. List 5 job control parameters.

a.

b.

c.

d.

e.

PREPARING JOBS FOR EXECUTION

INFORMATION SHEET

I. Terms and definitions

   A. Alignment--To position accurately, preprinted forms in the printer.

   B. Control records--A collection of records that designate and define a unit of work for the computer to perform. May be in the form of control cards or a control file on disk or tape.

   C. Interactive job--A job wherein there is interaction between users and the computer via telecommunication or local terminals.

   D. I/O bound--A condition where job execution is in an idle state waiting for the input or output devices to complete the transfer of data.

   E. Peripheral equipment--Any unit of equipment used in conjunction with a computing system that is not an integral part of the central processing unit of the computer.

   F. Spooling--The reading and writing of input and output data records on auxiliary storage devices, such as tape or disk, in a format convenient for later processing or output operations.

   G. Volumes--The portion of a single unit of external storage that can be read or written by a single reading or writing mechanism. A volume usually is an entire magnetic tape, drum, or disk.

   H. Working storage--An area of main internal storage reserved for data that is actually being processed or in some intermediate state of computation. Its size depends on the program's requirements.

II. Types of jobs to be run

   A. I/O bound jobs.

   B. Long running jobs.

   C. Short running jobs.

   D. Interactive jobs.

III. Conditions to be considered when scheduling peripheral equipment

   A. Jobs requiring private volumes (tape/disk) can only be run when peripherals are available.

   B. Jobs requiring large amounts of slow peripheral time are scheduled at off times.

   C. Jobs requiring large amounts of slow peripheral time should have I/O spooled before and after job run.

IV. Steps in running a job

   A. If job is to be run in sequence, check that previous jobs have been completed prior to run.

   B. Check that control file or control cards are correctly assembled.

   C. Ready input media (mount appropriate tape, disk, etc.).

   D. Ready output devices with appropriate forms, where required.

   E. Load and run job.

   F. Log start and stop times (if applicable).

V. Job control parameters

   A. Name of job.

   B. Prerequisites to job. (What needs to be done first.)

   C. Time of day critical to job run.

   D. Estimate time needed to execute job.

   E. Estimate working space needed to execute job.

   F. Number of files needed for job.

   G. Special peripheral equipment required.

PREPARING JOBS FOR EXECUTION

ASSIGNMENT SHEET #1--CATEGORIZING THE JOB

Given the list of jobs below, categorize each job by type, by placing an A, B, C, or D in the space before the job using the following key:

A. I/O bound jobs

B. Long running jobs

C. Short running jobs

D. Interactive jobs

1)__Job that acquires laboratory analysis measurements from slow A/D channels and stores it on magnetic tape for future processing.

2)__Job that allows office personnel to update a data base from terminals.

3)__Job to produce a multi-keyed, sorted list to cross reference 750 employee files.

4)__Job that enters building structural change specifications and re-drafts floor plan on a plotter.

5)__Job to enter payroll time sheets and produce the current week's payroll checks.

6)__Job run which transfers salesman's records from tape files to punch cards.

7)__Job to run statistical package for an individual's research project requiring large amounts of data from the user's private tape volume.

8)__Job that adjusts electric utility demand by cycling equipment during the afternoon peak load period.

9)__Run job to load from cards monthly sales information and update disk files.

10)__Run job to send system diagnostic information to a remote site via phone lines in order to determine if system maintenance is required.

PREPARING JOBS FOR EXECUTION

ASSIGNMENT SHEET #2--SCHEDULING THE JOB

Given the job list and types from Assignment Sheet #1, schedule the day's run by using the job control parameters and peripheral equipment scheduling conditions from the Information Sheet. List the jobs from 1 to 10 in order of most important to least important.

PREPARING JOBS FOR EXECUTION

ANSWERS TO ASSIGNMENT SHEET #1

1) A
2) D
3) B
4) A
5) C
6) A
7) B
8) C
9) A
10) D

ANSWERS TO ASSIGNMENT SHEET #2

The sequence below is a suggested order. Interpretation, variety of equipment, and discussion of control parameters could vary this sequence.

a) 6
b) 2
c) 7
d) 10
e) 3
f) 9
g) 5
h) 1
i) 4
j) 8

PREPARING JOBS FOR EXECUTION

JOB SHEET #1--SELECT AND LOAD FORMS NEEDED FOR A JOB

I. Equipment and materials

   A. Computer with printer.

   B. Selected program with appropriate media.

   C. Required forms.

II. Procedure

   A. Secure and load appropriate media.

   B. Identify forms required for program.

   C. Load forms onto printer.

   D. Run selected program.

   E. Adjust printer to register forms.

   F. Remove forms from printer at end of job.

   G. Place media in storage.

   H. Clean work area before leaving.

PREPARING JOBS FOR EXECUTION

TEST

1. TRUE OR FALSE: Using "T" or "F", indicate if the following statements are true or false.

_____a. If a job is to be run in sequence, check that previous jobs have been completed prior to the run.

_____b. Jobs requiring private volumes can only be run when peripherals are available.

_____c. A job control parameter would be the entering of start and stop times in a job.

_____d. When running a job, the operator must ready output devices with appropriate forms.

_____e. Jobs requiring small amounts of fast peripheral time should have I/O spooled before, as well as, after job run.

_____f. Jobs requiring large amounts of slow peripheral time are scheduled at off times.

2. MULTIPLE CHOICE: Circle the number of the correct answer.

a. __?__ is used in conjunction with a computing system that is not an integral part of the CPU.

1. Working storage	3. Peripheral equipment
2. I/O equipment	4. Online equipment

b. __?__ designate and define a unit of work for the computer to perform.

1. Formats	3. Volumes
2. Control records	4. Job run sheets

c. A __?__ usually is an entire magnetic tape, drum, or disk.

1. volume	3. working storage
2. spool	4. record

d. ___?___ is the reading and writing of input and output data records on auxiliary storage devices.

1. Pooling	3. Running
2. Spooling	4. Interacting

e. The conditon where job execution is in an idle state is known as

1. interactive.	3. static.
2. pending.	4. I/O bound.

PREPARING JOBS FOR EXECUTION

ANSWERS TO PRETEST

1. a. 5
   b. 8
   c. 3
   d. 2
   e. 6
   f. 1
   g. 7
   h. 4

2. Answers may appear in any order.
   a. I/O bound jobs.
   b. Long running jobs.
   c. Short running jobs.
   d. Interactive jobs.

3. Answers may appear in any order.
   a. Jobs requiring private volumes (tape/disk) can only be run when peripherals are available.
   b. Jobs requiring large amounts of slow peripheral time are scheduled at at off times.
   c. Jobs requiring large amounts of slow peripheral time should have I/O spooled before and after job run.

4. Answers should appear in logical order.
   a. If job is to be run in sequence, check that previous jobs have been completed prior to run.
   b. Check that control file or control cards are correctly assembled.
   c. Ready input media.
   d. Ready output devices with appropriate forms, where required.
   e. Load and run job.
   f. Log start and stop times.

5. Answers may appear in any order.

   a. Name of job.

   b. Prerequisites to job.

   c. Estimate time needed to execute job.

   d. Estimate working space needed to execute job.

   e. Number of files needed for job.

   f. Time of day critical to job run.

   g. Special peripheral equipment.

PREPARING JOBS FOR EXECUTION

ANSWERS TO TEST

1. True or False.

a. T	d. T
b. T	e. F
c. F	f. T

2. Multiple Choice.

a. 3	d. 2
b. 2	e. 4
c. 1	f. 2

DATA CONTROL FUNCTIONS

UNIT OBJECTIVE

After completion of this unit, the student should be familiar with data control functions and be able to operate an input device. This knowledge will be evidenced through assignments, demonstration, and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to data control functions to the correct definitions.
2. Describe the importance of backup media.
3. List four common backup media.
4. Describe the duties of the computer operator with respect to data concontrol functions.
5. Describe the items in a run book.
6. Demonstrate the ability to operate input devices appropriate to the computer used.

PREREQUISITES

Computer Operation

DATA CONTROL FUNCTIONS

SUGGESTED ACTIVITIES

I. Instructor

  A. Give pretest.

  B. Provide student with objective sheet.

  C. Provide student with information, assignment, and job sheets.

  D. Discuss unit and specific objectives.

  E. Discuss information, assignment and job sheets.

  F. Provide students with a data control log or a facsimile of one.

  G. Arrange to take students to a computer installation.

  H. Have appropriate materials available so student can complete job sheet.

  I. Give test.

II. Student:

  A. Take pretest.

  B. Read objective sheet.

  C. Study information sheets.

  D. Complete assignment and job sheets.

  E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet.

  B. Information sheets.

  C. Transparency master TM 1 - Data Processing Schedule.

D. Assignment sheets: #1--Maintaining a Run Book.

#2--Observation of I/O Operations in a Computer Center.

E. Job sheet #1--Operation of an input device.

F. Pretest and test.

G. Answers to pretest and test.

II. References

A. Carver, D. K. Introduction to Business Data Processing. New York: John Wiley & Sons, Inc., 1979.

B. Couger, J. Daniel and Fred R. McFadden. A First Course in Data Processing. Santa Barbara: Wiley/Hamilton Publication, 1977.

C. DeRossi, Claude J. Exploring the World of Data Processing. Reston, Virginia: Reston Publishing Company, Inc., 1975.

D. Dock, V. Thomas and Edward Essick. Principles of Business Data Processing. Science Research Associates, 1978.

E. Orilia, Lawrence S. Introduction to Business Data Processing. New York: McGraw-Hill Book Company, 1979.

F. Wu, Margaret S. Introduction to Computer Data Processing, second edition. New York: Harcourt Brace Jovanovich, Inc., 1979.

G. Manufacturer's operating manuals.

H. References available in your school.

DATA CONTROL FUNCTIONS

PRETEST

1. Match the terms on the right to the correct definition.

_____a. May include the serial numbering of invoices and paychecks or totaling and balancing to some predetermined total.

_____b. Necessary to assure the complete and accurate conversion of data from source documents.

_____c. A duplicate copy of a file.

_____d. The person or organization for whom a particular program or job is being run.

_____e. Necessary to minimize mistakes and misuse of information and protect against improper or fraudulent use of resources and data.

_____f. A listing of applications scheduled for processing on one shift.

_____g. Responsibile for preparing the schedules so that all job requirements for processing will be satisfied on time.

1. Backup file
2. Controls
3. Input control
4. I/O control group
5. Source document control
6. Run book
7. User

2. Describe the importance of backup media.

3. List 4 common backup media.

a.

c.

b.

d.

4. List 5 duties of the computer operator with respect to data control functions.

   a.

   b.

   c.

   d.

   e.

   f.

   g.

5. Describe the items in a run book.

DATA CONTROL FUNCTIONS

INFORMATION SHEET

I. Terms and definitions

A. Backup file--A duplicate copy of a file, which can be used to regenerate a file when it has been damaged or altered and rendered unusable.

B. Controls--Checks applied within a data processing system to minimize mistakes and misuse of information. Controls also protect against the improper or fraudulent use of resources and data. The control procedures indicate the level of security incorporated into a system.

C. Input controls--These controls are important because they assure the complete and accurate conversion of data from the source documents. Key verifications is an example of input control.

D. I/O control group (IOCG)--It is the responsibility of this group to prepare the schedules, both daily-run and regularly scheduled types, so that all job requirements for processing will be satisfied on time. This group is also responsible for making sure all supplies required for each application be available to the operator. This includes magnetic tapes or disks, card files, test data, special paper, forms, etc.

E. Source document control--These controls would include the serial numbering of invoices and paychecks, registering of documents as to time received, and totaling and balancing to some predetermined total to assure accuracy. It is important that source documents are accounted for when the data is prepared for processing.

F. Run book--A listing of applications scheduled for processing on one shift. A run book would be composed of schedules for both regularly scheduled and daily jobs. The format of this listing may vary from company to company. The information in the run book is available to the operator for efficient data control. (TM 1)

G. User--The person or organization for whom a particular program or job is being run. This person is usually not involved in programming and may have very little knowledge of computer operations. He is often primarily interested in the data involved in I/O.

II. Importance of backup file

Adequate controls must be established for two basic reasons:
1) To insure the accurate processing of data and the accurate retrieval of information from the systems; 2) To prevent computer-related fraud.

In nearly every data processing system there exists the possiblity that errors may take place which may alter or destroy data stored in data bases and files. This may be the result of natural disasters, or it may be the result of improper processing of data. Therefore, it is important to provide a means to ensure that any lost data can be recovered. The most common method used is a backup file.

Most systems will provide for creating a backup file on a regular basis, as often as every hour, and saving transactions which occur to the file until the backup file is made.

III. Common backup media

A. Magnetic Tape

B. Disk

C. Floppy Disk

D. Punch Cards

IV. Duties of operator with respect to data control functions

A. To be knowledgeable of I/O equipment on the system to the extent that it can be readily recognized when the equipment is malfunctioning.

B. To understand the operation of the I/O equipment to the extent that it can be recognized when to correct small problems and make minor adjustments on I/O devices and thus improve the quality of user output.

C. To understand the user's needs and schedule and to see that output is distributed to the user on time.

D. To recognize obvious errors in output and to see that appropriate actions are taken to minimize errors and time loss.

E. To see that backups are maintained and current and that appropriate media is available for backup.

F. To train personnel in methods of handling I/O data, for which the operator is responsible.

G. Maintain appropriate logs and use the information provided by such logs.

DATA PROCESSING SCHEDULE

TIME	EST HRS	PROGRAM	DESCRIPTION
-	.05	1-27-01	ACTION SHEET LIST
-	.04	7-21-10	EARNING DUMP AFTER ACTION SHEETS
-	.20	4-20-07	MONTHLY EARNINGS DETAIL LISTS (ALPHABETIC 1ST PHASE)
-	.85	4-20-07	MONTHLY EARNINGS DETAIL LISTS (ALPHABETIC PHASE)
08-00 A	.08	2-10-09	A/R INQUIRY
08-00 A	.02	2-53-02	CLEAN TAPE DRIVES
08-05 A	.50	2-13-02	ACCOUNTS RECEIVABLE INSURANCE BILLING LISTS
08-30 A	.02	3-11-02	A/R INS BILLING INQUIRY STATEMENTS
09-30 A	.02	2-11-06	CONVERT CHARGES
09-32 A	.08	2-19-03	INVENTORY COUNT
09-42 A	.02	2-19-05	CERTIFICATION PROGRAM
09-45 A	.12	2-19-10	QUARTERLY LISTS
09-50 A	.06	2-11-05	PRELIST A/R BATCHES
10-00 A	.02	2-11-08	INQUIRY CLIENT STATEMENTS (ON DISK), CONSOLE INPUT
08-30 P	.67	2-11-07	POST CHARGES TO ACCOUNTS RECEIVABLE
09-15 P	.10	7-21-10	ACCOUNTS RECEIVABLE DISK TO TAPE UTILITY-AFTER POSTING

TM 1

DCF 8

DATA CONTROL FUNCTIONS

ASSIGNMENT SHEET #1--MAINTAINING A RUN BOOK

Using a Run book made available by your instructor, or TM 1, answer the following:

1. List all items included in the log.

2. What is the use of this log?

3. For whom is it kept?

DATA CONTROL FUNCTIONS

ASSIGNMENT SHEET #2--OBSERVATION OF I/O OPERATIONS IN A COMPUTER CENTER

Under the supervision of an operator or your instructor, observe and monitor the results of an output device during the execution of a job.

Complete the following based on your observations:

Installation visited______________________________

Make and model of computer observed__________________________

Type of output device used_________________________________

Did any errors occur during your observation__________

If yes, explain how they affect output and how they were corrected_______

____

Additional comments____

____

DATA CONTROL FUNCTIONS

JOB SHEET #1--OPERATION OF AN INPUT DEVICE

Under the supervision of an operator or your instructor, use an appropriate input device to load a program and related data and execute a job.

Equipment and Tools:

1. Computer system
2. Input device
3. Program stored on an appropriate medium for device being used
4. Data required by program

Procedure:

1. Activate input device
2. Load media containing program and data
3. Execute job
4. Screen for errors and initiate corrections
5. Power down device
6. Practice good housekeeping procedures
7. Distribute output to users

DATA CONTROL FUNCTIONS

TEST

1. TRUE OR FALSE: Using "T" or "F", indicate if the following statements are true or false.

_____a. The operator must be able to recognize obvious errors in input and be able to correct the errors prior processing.

_____b. The control procedures are an indication of the level of security incorporated into a system.

_____c. The user is always involved in programming, as well as, the computer operations.

_____d. The IOCG is responsible for maintaining all backup media.

_____e. Run books are highly standardized and used in the same way by all companies.

_____f. Punch cards and magnetic tape are common backup media.

_____g. A backup file provides a means of recovering any lost data.

_____h. The operator is responsible for informing the user as to when the output will be ready, based on the operator's schedule.

_____i. Adequate controls insure the accurate processing of data.

_____j. Key verification is an example of input control.

DATA CONTROL FUNCTIONS

ANSWERS TO PRETEST

1. a. 5 c. 1 e. 2 g. 4
   b. 3 d. 7 f. 6

2. Answer should be similar to II on the Information Sheet.

   Since the possibility of either corrupting or destroying data always exists through machine malfunction or programmer error, it is imperative that appropriate backups be maintained. Often data cannot be recreated and the backup is the only source of information should a problem occur.

3. Answers may appear in any order.

   a. Magnetic Tape c. Floppy Disk
   b. Disk d. Punch Cards

4. Answers may appear in any order and should be similar to five of the following:

   a. To be knowledgeable of I/O equipment on the system to the extent that it can be readily recognized when the equipment is malfunctioning.

   b. To understand the operation of the I/O equipment to the extent that it can be recognized when to correct small problems and make minor adjustments on I/O devices and thus improve the quality of user output.

   c. To understand the user's needs and schedule and to see that output is distributed to the user on time.

   d. To recognize obvious errors in output and to see that appropriate actions are taken to minimize errors and time loss.

   e. To see that backups are maintained and current and that appropriate media is available for backup.

   f. To train personnel in methods of handling I/O data, for which the operator is responsible.

   g. Maintain appropriate logs and use the information provided by such logs.

5. Answers must be provided by the teacher.

DATA CONTROL FUNCTIONS

ANSWERS TO TEST

TRUE OR FALSE.

a. F
b. T
c. F
d. F
e. F
f. T
g. T
h. F
i. T
j. T

OPERATION AND MAINTENANCE OF PERIPHERAL EQUIPMENT

UNIT OBJECTIVE

After completion of this unit, the student should be familiar with the operation and maintenance of peripheral equipment and maintenance of computer logs. This knowledge will be evidenced through assignments, demonstration, and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to maintenance and operation of peripheral equipment to the correct definition.
2. List tasks related to routine operating maintenance.
3. List tasks related to minor corrective maintenance.
4. List steps in coordinating service on all equipment.
5. List steps in maintaining service and operational logs.
6. Demonstrate ability to perform equipment care on a selected piece of equipment.

PREREQUISITES

Common Features of Data Processing Systems

OPERATION AND MAINTENANCE OF PERIPHERAL EQUIPMENT

SUGGESTED ACTIVITIES

I. Instructor:
   A. Give pretest.
   B. Provide student with objective sheet.
   C. Provide student with information, assignment, and job sheets.
   D. Discuss unit and specific objectives.
   E. Discuss information, assignment, and job sheets.
   F. Give test.

II. Student:
   A. Take pretest.
   B. Read objective sheets.
   C. Study information sheets.
   D. Complete assignment and job sheets.
   E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:
   A. Objective sheet.
   B. Information sheet.
   C. Assignment sheet #1--System Configuration.
   D. Job sheet #1--Equipment Care.
   E. Pretest and test.
   F. Answers to pretest and test.

II. References:

A. Carver, D. K. Introduction to Business Data Processing. New York: John Wiley & Sons, Inc., 1979.

B. Couger, J. Daniel and Fred R. McFadden. A First Course in Data Processing. Santa Barbara: Wiley/Hamilton Publication, 1977.

C. DeRossi, Claude J. Exploring the World of Data Processing. Reston, Virginia: Reston Publishing Company, Inc., 1975.

D. Dock, V. Thomas and Edward Essick. Principles of Business Data Processing. Science Research Associates, 1978.

E. Orilia, Lawrence S. Introduction to Business Data Processing. New York: McGraw-Hill Book Company, 1979.

F. Wu, Margaret S. Introduction to Computer Data Processing, second edition. New York: Harcourt Brace Jovanovich, Inc., 1979.

G. Manufacturer operating manuals.

H. References available in your school.

OPERATION AND MAINTENANCE OF PERIPHERAL EQUIPMENT

PRETEST

1. Match the terms on the right to the correct definition.

_____a. A printer that has type slugs mounted on the links of a rotating chain.

_____b. A non-impact printer that uses specially coated paper to create an image.

_____c. A sequential access device that reads or records data magnetically on reels of tape.

_____d. A strip of paper on which data is stored in the form of punched holes.

_____e. A direct access device that reads and records data magnetically on rotating disks.

_____f. A machine that separates continuous-form paper into discrete sheets.

_____g. A card punched with a pattern of holes to represent data.

_____h. A printer which can print either a solid character or a dot matrix character.

_____i. The component of the recording device at which the magnetic data transfer actually takes place.

_____j. A high speed printer.

_____k. A wheel-shaped type element used in small printers.

_____l. A machine that separates the plies of multipart forms and removes the interleaved carbon.

_____m. An input/output device used to read or punch data on cards.

1. Burster
2. Card handling device
3. Carriage control tapes
4. Chain printer
5. Decollator
6. Disk drive
7. Drum printer
8. Impact printer
9. Jet-ink printer
10. Matrix printer
11. Non-impact printer
12. Paper tape
13. Peripheral equipment
14. Printer
15. Print wheel
16. Punch card
17. Recording head
18. Sorter
19. Tape drive
20. Typebar
21. Type element

_____n. An impact printer that forms characters by a series of small dots.

_____o. The device used to order a group of cards in numerical or alphabetic sequence.

_____p. A paper or vinyl-coated tape containing data that controls line feeds and vertical tab information for a printing device.

_____q. A general term to describe all devices that can be attached to a computer system.

_____r. A linear type element that contains a complete set of characters used in a printing device.

_____s. An individual metal or plastic element with alphabetic, numeric, and special symbols machined into its outer surface.

_____t. An output device that produces a permanent hard copy in the form of characters or symbols on paper or card stock.

_____u. A device which uses a specially coated paper that responds to thermal stimulus.

2. List 6 tasks related to routine operating maintenance.

a.

b.

c.

d.

e.

f.

3. List 3 tasks related to minor corrective maintenance.

a.

b.

c.

4. List 4 steps in coordinating service on equipment.

   a.

   b.

   c.

   d.

5. List necessary steps in maintaining service and operational logs.

   a. Operational log activities:

      1.

      2.

      3.

   b. Service log activities:

      1.

      2.

      3.

OPERATION AND MAINTENANCE OF PERIPHERAL EQUIPMENT

INFORMATION

I. Terms and definitions

A. Burster--A machine that separates continuous-form paper into discrete sheets.

B. Card handling device--An input/output device used to read or punch data on cards, i.e. card punch, card reader.

C. Carriage control tape--A paper or vinyl-coated tape containing data that controls line feeds and vertical tab information for a printing device.

D. Chain printer--An impact printer that has type slugs mounted on the links of a rotating chain. Printing occurs when hammers at each print position are driven against the paper, an inked ribbon, and the chain as the characters are moved into the correct position.

E. Decollator--A machine that separates the plies of multipart forms and removes the interleaved carbon.

F. Disk drive--A direct access device that reads and records data magnetically on rotating disks.

G. Drum printer--A high-speed printer that features a cylindrical drum which rotates to position characters for printing.

H. Impact printer--A device which transfers the image on to paper by some type of printing mechanism, striking the paper, ribbon, and character together. This printer can print either a solid character or a dot matrix character. This printer can create carbons, but is rather noisy.

I. Jet-ink printer--A non-impact printer that uses specially coated paper to create an image.

J. Matrix printer--An impact printer that forms characters by a series of small dots.

K. Non-impact printer--A device which generally uses a specially coated or sensitized paper that responds to thermal or electrostatic stimuli to form an image. This device cannot create carbons, but is rather quiet.

L. Paper tape--A strip of paper on which data is stored in the form of punched holes.

M. Peripheral equipment--A general term to describe all devices that can be attached to a computer system.

N. Printer--An output device that produces a permanent hard copy in the form of characters or symbols on paper or card stock.

O. Print wheel--A wheel-shaped type element used in small impact printers. This rotating wheel is driven against paper, an inked ribbon, and a platen, causing printing to occur.

P. Punch card--A card punched with a pattern of holes to represent data.

Q. Recording head--The component of the recording device at which the magnetic data transfer actually takes place.

R. Sorter--The device used to order a group of cards in numerical or alphabetic sequence.

S. Tape drive--A sequential access device that reads or records data magnetically on reels of tape.

T. Typebar--A linear type element that contains a complete set of characters used in a printing device.

U. Type element--An individual metal or plastic element with alphabetic, numeric, and special symbols machined into its outer surface.

II. Routine operating maintenace.

A. Change ribbons and ink rollers.

B. Replace printwheels, type elements.

C. Replace worn carriage control tapes.

D. Duplicate often used control cards, utility paper tapes, cassettes, etc.

E. Minor mechanical adjustments (tension, size, etc.) to reprinters and forms handling equipment (burster, decollator).

F. Clean keyboards, screens, and internal machine spaces.

III. Minor corrective maintenance.

A. Clear jammed forms in printer and card handling equipment.

B. Clean typebars, printer chains, and printer drums.

Clean disk and tape recording heads.

IV. Coordination of service on equipment.

  A. Schedule regular preventative maintenance. (If not handled by data processing manager).

  B. Isolate system problems as much as possible to a specific component of the system.

  C. Place service calls on equipment requiring field service.

  D. Confer with field engineers as to the nature and cause of the problem.

V. Maintenance of service and operational log.

  A. Operational log activities:

    1. Record daily usage of system activity.

    2. File activity reports chronologically for reference.

    3. Record user chargers for accounting purposes.

  B. Service log activities:

    1. Record minor corrective maintenance performed by operators.

    2. Record scheduled preventative maintenance performed on system.

    3. File maintenance reports to update system performance history.

OPERATION AND MAINTENANCE OF PERIPHERAL EQUIPMENT

ASSIGNMENT SHEET #1--SYSTEM CONFIGURATION

Visit a local computer site. Outline the system configuration by listing the following items:

1. System type and manufacturer.
2. Memory size and bytes.
3. For each peripheral device list:
   - type of device and application
   - speed or size of device
   - physical location
4. List computer system applications at this site in order of frequency.
5. List the number and job titles of the personnel present at this site on a full work shift.

OPERATION AND MAINTENANCE OF PERIPHERAL EQUIPMENT

JOB SHEET #1--EQUIPMENT CARE

Materials and Equipment:

1. A selected piece of system peripheral equipment.
2. Manufacturer's suggested operating maintenance procedures.
3. Operating supplies needed for a specific equipment care operation.
4. Service activity log.

Procedure:

1. Select a specific peripheral device from the system at the local site.
2. Perform, according to manufacturer's suggestions, one of the specific equipment care operations on the selected device.
3. Record the maintenance activity in the service log.

OPERATION AND MAINTENANCE OF PERIPHERAL EQUIPMENT

TEST

1. MULTIPLE CHOICE: Circle the number of the correct answer.

   a. A ___?___ produces a permanent hard copy in the form of characters or symbols on paper or card stock.

      1. decollator
      2. printer
      3. burster
      4. disk drive

   b. A linear type element that contains a complete set of characters used in a printing device is called a

      1. typebar.
      2. type element.
      3. impact printer.
      4. decollator.

   c. A ___?___ separates continuous-form paper into discrete sheets.

      1. sorter
      2. decollator
      3. jet-ink printer
      4. burster

   d. A ___?___ printer cannot create a carbon but is quiet while a ___?___ is noisy but can create a carbon.

      1. chain, disk
      2. non-impact, impact
      3. punch card, paper tape
      4. impact, non-impact

   e. A ___?___ printer is an impact printer that has slugs mounted on the links of a chain.

      1. slug
      2. drum
      3. carriage
      4. chain

   f. A device used to order a group of cards in numerical or alphabetic sequence is called a

      1. burster.
      2. card drive.
      3. decollator.
      4. sorter.

g. An example of a high-speed printer is a ? printer.

1. chain
2. jet-ink
3. drum
4. punch card

h. The ? device is used to read or punch data on cards.

1. card handling
2. disk
3. carriage control
4. punch card

i. The ? separates the piles of multipart forms and removes the interleaved carbon.

1. burster
2. printer
3. decollator
4. sorter

j. The ? printer is an example of a non-impact printer and the ? printer is an example of an impact printer.

1. jet-ink, disk drive
2. jet-ink, matrix
3. matrix, chain
4. matrix, jet-ink

2. TRUE STATEMENTS: Circle the letters of all the true statements.

a. Data is stored in the form of punched holes when paper tape is used.

b. In an operational log, the operator records the daily usage of system activity.

c. Routine maintenance would include scheduling preventative maintenance for all equipment in the data processing department.

d. A print wheel is often the element used in small impact printers.

e. A tape drive is a sequential access device that reads or records data on reels of paper tape.

f. Replacing print wheels, type elements, and worn carriage oontrol tapes is considered routine operating maintenance.

g. The service log records minor corrective maintenance performed by operators.

h. Minor corrective maintenance would include cleaning keyboards, screens, and internal machine spaces.

i. The component of a recording device at which the magnetic data transfer takes place is the recording head.

j. A punch card is marked with black-ink dots to record data.

OPERATION AND MAINTENANCE OF PERIPHERAL EQUIPMENT

ANSWERS TO PRETEST

1. a. 4
   b. 9
   c. 19
   d. 12
   e. 6
   f. 1
   g. 16
   h. 8
   i. 17
   j. 7
   k. 15
   l. 5
   m. 2
   n. 10
   o. 18
   p. 3
   q. 13
   r. 20
   s. 21
   t. 14
   u. 11

2. Answers may appear in any order.

   a. Change ribbons and ink rollers.

   b. Replace printwheels, type elements.

   c. Replace worn carriage control tapes.

   d. Duplicate often used control cards, utility paper tapes, cassettes, etc.

   e. Minor mechanical adjustments (tension, size, etc.) to printers and forms handling equipment (burster, decollator).

   f. Clean keyboards, screens and internal machine spaces.

3. Answers may appear in any order.

   a. Clear jammed forms in printer and card handling equipment.

   b. Clean typebars, printer chains, and printer drums.

   c. Clean disk and tape recording heads.

4. Answers may appear in any order.

   a. Schedule regular preventative maintenance.

   b. Isolate system problems as much as possible to a specific component of the system.

   c. Place service calls on equipment requiring field service.

   d. Confer with field engineers as to the nature and cause of the problem.

5. Answers may appear in any order.
    a. Operational log activities:
        1. Record daily usage of system activity.
        2. File activity reports chronologically for reference.
        3. Record user charges for accounting purposes.
    b. Service log activities:
        1. Record minor corrective maintenance performed by operators.
        2. Record scheduled preventative maintenance performed on system.
        3. File maintenance reports to update system performance history.

OPERATION AND MAINTENANCE OF PERIPHERAL EQUIPMENT

ANSWERS TO TEST

1. Multiple Choice.
   - a. 2
   - b. 1
   - c. 4
   - d. 2
   - e. 4
   - f. 4
   - g. 3
   - h. 1
   - i. 3
   - j. 2
2. True Statements.
   - a. T
   - b. T
   - c. F
   - d. T
   - e. F
   - f. T
   - g. T
   - h. T
   - i. T
   - j. F

DATA SUPPORT FUNCTIONS

UNIT OBJECTIVE

After completion of this unit, the student should be familiar with data support functions. This knowledge will be evidenced through completion of assignments and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to data support functions to the correct definitions.
2. List activities that need be considered for most efficient use of computer equipment.
3. List the activities required in planning facility modifications.
4. List procedures in handling special requests for data processing services.
5. Describe types of correspondence involved in data processing services.
6. Describe activities involved in maintenance of materials and supplies inventory.

PREREQUISITES

Computer Operation

Preparing Jobs for Execution

Data Control Functions

Operations and Maintenance of Peripheral Equipment

DATA SUPPORT FUNCTIONS

SUGGESTED ACTIVITIES

I. Instructor:

  A. Give pretest.

  B. Provide student with objective sheet.

  C. Provide student with information and assignment sheets.

  D. Discuss unit and specific objectives.

  E. Discuss information and assignment sheets.

  F. Assignment Sheet #1--You may find that students cannot complete this assignment because of your facilities. Alter assignment to fit your situation.

  G. Assignment Sheet #2--You may find that students cannot complete this assignment because of your facilities. Alter assignment to fit your situation.

  H. Assignment Sheet #3--Have a list of addresses for local and nationwide vendors available for student use. This will prevent everyone writing to one vendor.

  I. Give test.

II. Student:

  A. Take pretest.

  B. Read objective sheet.

  C. Study information sheets.

  D. Complete assignment sheets.

  E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet

  B. Information sheets

C. Assignment Sheets: #1--Facility Modification
   #2--Supplies Inventory
   #3--Corresponding with Vendors

D. Answers to assignment sheets.

E. Pretest and test

F. Answers to pretest and test.

II. References:

A. Carver, D. K. Introduction to Business data processing. New York: John Wiley & Sons, Inc., 1979.

B. Couger, J. Daniel and Fred R. McFadden. A First Course in Data Processing. Santa Barbara: Wiley/Hamilton Publication, 1977.

C. DeRossi, Claude J. Exploring the World of Data Processing. Reston, Virginia: Reston Publishing Company, Inc., 1975.

D. Dock, V. Thomas and Edward Essick. Principles of Business Data Processing. Science Research Associates, 1978.

E. Orilia, Lawrence S. Introduction to Business Data Processing. New York: McGraw-Hill Book Company, 1979.

F. Wu, Margaret S. Introduction to Computer Data Processing, second edition. New York: Harcourt Brace Jovanovich, Inc., 1979.

G. Manufacturer operating manuals.

H. References available in your school.

DATA SUPPORT FUNCTIONS

PRETEST

1. Match the terms on the right to the correct definition.

_____a. A company which markets computer equipment and supplies.

_____b. A term used to refer to the program procedures, rules, and information concerned with the operation of the computer system.

_____c. Physical equipment or machinery, such as a computer and components.

_____d. Contains the CPU and main computer storage.

_____e. A measure of the extent to which a system can operate without failure in a specified period of time or amount of usage.

1. Hardware
2. Processor
3. Software
4. System reliability
5. Vendor

2. List 4 activities that need be considered for most efficient use of computer equipment.

a.

b.

c.

d.

3. List 4 activities required in planning facility modifications.

a.

b.

c.

d.

4. List 4 procedures used in the handling of special requests for data processing services.

   a.

   b.

   c.

   d.

5. Describe 5 types of correspondence involved in data processing services.

   a.

   b.

   c.

   d.

   e.

6. Describe 5 activities involved in maintenance of materials and supplies inventory.

   a.

   b.

   c.

   d.

   e.

DATA SUPPORT FUNCTIONS

INFORMATION SHEET

I. Terms and definitions

  A. Hardware--Physical equipment or machinery, such as a computer and components.

  B. Processor--The unit which stores the data and carries out the processing of stored data. It contains the CPU and main computer storage.

  C. Software--A term used to refer to the program procedures, rules, and information concerned with the operation of the computer system.

  D. System reliability--A measure of the extent to which a system can operate without failure in a specified period of time or amount of usage.

  E. Vendor--A company which markets computer equipment and supplies.

II. Efficient use of computer equipment

  A. Place equipment for most efficient access by users.

  B. Implement software changes to make system easier to use.

  C. Investigate new applications for system.

  D. Anticipate expansion needs as system use increases.

III. Planning facility modifications

  A. Investigate system needs in terms of processor load, peripheral equipment, and system reliability.

  B. Investigate system needs in terms of additional operating personnel, software support, and hardware support.

  C. Specify space requirements needed for additional hardware and staff.

  D. Propose a time table with appropriate rationale for implementing changes.

IV. Handling special requests for data processing services

  A. Assist users in setting up jobs to be implemented on the computer.

  B. Coordinate programming efforts to implement a given job.

C. Instruct users in running new jobs on the system.

D. Provide a means of feedback between users and programmers to facilitate operation of a new sub-system.

V. Correspondence involved in data processing services

A. Handle correspondence for renewal of contracts with software and hardware vendors.

B. Information concerning new systems and equipment. Bids to vendors for new equipment.

C. Invoices and notices concerning system-usage charges.

D. Routine service correspondence.

E. Information to users of system operating schedule changes.

F. Information to users about new services available.

VI. Maintenance of materials and supplies

A. Conduct periodic inventory of supplies on hand.

B. Keep abreast of vendors which supply items for the system.

C. Investigate new materials as they become available.

D. Substitute new items for old when cost or effectiveness warrants.

E. Anticipate needs by ordering supplies when inventory becomes low.

DATA SUPPORT FUNCTIONS

ASSIGNMENT SHEET #1--FACILITY MODIFICATION

Examine your present data processing facility.

A. List the new or additional equipment you would recommend to be installed at your site. Specify at least three items in order of importance.

B. List conditions that could be altered to improve the efficiency of the facility.

DATA SUPPORT FUNCTIONS

ASSIGNMENT SHEET #2--SUPPLIES INVENTORY

If you have access to a system, inspect the system peripherals and make a list of the supplies needed for the operation of the equipment.

DATA SUPPORT FUNCTIONS

ASSIGNMENT SHEET #3--CORRESPONDING WITH VENDORS

Write a business letter to a computer equipment vendor requesting information on their company's line of small business system hardware.

DATA SUPPORT FUNCTIONS

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1--Some possible answers may be:

A. --additional terminals
   --additional storage (disk, tape)
   --additional printers

B. --change of system availability time
   --larger work rooms
   --improvements in software system

Assignment Sheet #2--Some possible answers may be:

A. Supplies used
   --paper
   --custom forms
   --cards
   --magnetic tape
   --disk packs
   --ribbons
   --printer elements
   --cleaning supplies
   --filing folders and binders

DATA SUPPORT FUNCTIONS

TEST

TRUE OR FALSE: Using "T" or "F", indicate if the following statements are true or false.

_____a. When determining computer use, it is important to anticipate expansion needs as system use increases.

_____b. A computer and its components are known as hardware.

_____c. Maintenance of materials involves the instruction of users on implementing change.

_____d. Correspondence may include invoices for system-usage charges.

_____e. The reliability of a system is measured by the accuracy of output.

_____f. When planning facility modifications, system needs must be met in terms of processor load, hardware and software support, and reliability.

_____g. A vendor sells computer time to users.

_____h. It is important to substitute new items for old when cost or effectiveness warrants.

_____i. The processor stores the data and carries out the processing of the stored data.

_____j. Users supply software while vendors supply hardware.

DATA SUPPORT FUNCTIONS

ANSWERS TO PRETEST

1. a. 5
   b. 3
   c. 1
   d. 2
   e. 4

2. Answers may appear in any order.

   a. Place equipment for most efficient access by users.

   b. Implement software changes to make system easier to use.

   c. Investigate new applications for system.

   d. Anticipate expansion needs as system use increases.

3. Answers may appear in any order.

   a. Investigate system needs in terms of processor load, peripheral equipment, and system reliability.

   b. Investigate system needs in terms of additional operating personnel, software support and hardware support.

   c. Specify space requirements needed for additional hardware and staff.

   d. Propose a time table with appropriate rational for implementing changes.

4. Answers may appear in any order.

   a. Assist users in setting up jobs to be implemented on the computer.

   b. Coordinate programming efforts to implement a given job.

   c. Instruct users in running new jobs on the system.

   d. Provide a means of feedback between users and programmers to facilitate operation of a new sub-system.

5. Answers may appear in any order.
    a. Handle correspondence for renewal of contracts with software and hardware vendors.
    b. Information concerning new systems and equipment. Bids to vendors for new equipment.
    c. Invoices and notices concerning system usage charges.
    d. Routine service correspondence.
    e. Information to users of system operating schedule changes.
    f. Information to users about new services available.
6. Answers may appear in any order.
    a. Conduct periodic inventory of supplies on hand.
    b. Keep abreast of vendors which supply items for system.
    c. Investigate new materials as they become available.
    d. Substitute new items for old when cost or effectiveness warrant.
    e. Anticipate needs by ordering supplies when inventory becomes low.

DATA SUPPORT FUNCTION

ANSWERS TO TEST

True or False

a. T
b. T
c. F
d. T
e. F
f. T
g. F
h. T
i. T
j. F

SUPERVISION OF DATA PROCESSING FUNCTIONS

UNIT OBJECTIVE

After completion of this unit, the student should be familiar with supervisory data processing functions the computer operator may be responsible for. This knowledge will be evidenced through assignments and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to supervisory functions to their correct definitions.
2. Describe types of communication for which the computer operator may be responsible.
3. List the types of experiences or knowledge that a computer operator must have to be a good supervisor.
4. List the responsibilities of the computer operator in the area of security.

PREREQUISITES

Computer Operation

Preparing Jobs for Execution

Data Entry Formats

Operations and Maintenance of Peripheral Equipment

Data Support Functions

SUPERVISION OF DATA PROCESSING FUNCTIONS

SUGGESTED ACTIVITIES

I. Instructor:

   A. Give pretest.

   B. Provide student with objective sheet.

   C. Provide student with information and assignment sheets.

   D. Discuss unit and specific objectives.

   E. Discuss information and assignment sheets.

   F. Assignment Sheet #1--Invite an operator to the class for a presentation or arrange for a field trip to an installation which employs a fair number of computer operators.

   G. Give test.

II. Student:

   A. Take pretest.

   B. Read objective sheet.

   C. Study information sheets.

   D. Complete assignment sheet.

   E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

   A. Objective sheet.

   B. Information sheets.

   C. Assignment sheet #1--Role of a Computer Operator.

   D. Pretest and test.

   E. Answers to pretest and test.

II. References

A. Carver, D. K. *Introduction to Business Data Processing*. New York: John Wiley & Sons, Inc., 1979.

B. Couger, J. Daniel and Fred R. McFadden. *A First Course in Data Processing*. Santa Barbara: Wiley/Hamilton Publication, 1977.

C. DeRossi, Claude J. *Exploring the World of Data Processing.* Reston, Virginia: Reston Publishing Company, Inc., 1975.

D. Dock, V. Thomas and Edward Essick. *Principles of Business Data Processing*. Science Research Associates, 1978.

E. Orilia, Lawrence S. *Introduction to Business Data Processing*. New York: McGraw-Hill Book Company, 1979.

F. Wu, Margaret S. *Introduction to Computer Data Processing*, second edition. New York: Harcourt Brace Jovanovich, Inc., 1979.

G. Manufacturer operating manuals.

H. References available in your school.

SUPERVISION OF DATA PROCESSING FUNCTIONS

PRETEST

1. Match the terms to the correct definition.

____a. A person who wishes to avail himself of the services of the computer center and has no previous experience with the particular system he wishes to use.

____b. The standard policies and situations under which the computer center operates.

____c. Maintenance which is performed periodically to check out the system and its components and correct minor problems before they become major problems.

____d. Training which is given to current employees to keep their skills and knowledge current with present procedures and directives.

____e. A complete listing of supplies on hand.

____f. The company that supplies the computer or software.

____g. A person who devises procedures which can be used by a computer, flow charts these procedures, writes instruction routines in a computer language, and later debugs these programs.

____h. The ordering of jobs by relative importance.

____i. Manuals supplied by the vendor on the specific use of a particular computer or software.

____j. Procedures which insure that programs, data, input, output, and computer operations are not available to unauthorized users.

____k. A listing of jobs to be run, and the time period in which to run each job.

1. Computer operating procedures
2. Inventory
3. New user
4. On-the-job training
5. Operation manuals
6. Preventive maintenance
7. Priority assignment
8. Production schedule
9. Programmer
10. Security procedures
11. Vendor

2. Describe 5 types of communication the computer operator may be responsible for.

   a.

   b.

   c.

   d.

   e.

3. List 5 types of knowledge that a computer operator must have to be a good supervisor.

   a.

   b.

   c.

   d.

   e.

4. List 6 areas important to the security of the computer center.

   a. d.

   b. e.

   c. f.

SUPERVISION OF DATA PROCESSING FUNCTIONS

INFORMATION SHEET

I. Terms and definitions

A. Computer operating procedures--The standard policies and situations under which the computer center operates.

B. Inventory--A complete listing of supplies on hand.

C. New user--A person who wishes to avail himself of the services of the computer center and has no previous experience with the particular system he wishes to use. He probably has little knowledge of computers and computer operations.

D. On-the-job training--Training which is given to current employees to keep their skills and knowledge current with present procedures and directives.

E. Operation manuals--Manuals supplied by the vendor on the specific use of a particular computer or software.

F. Preventive maintenance--Maintenance which is performed periodically to check out the system and its components and correct minor problems before they become major problems.

G. Priority assignment--The ordering of jobs by relative importance.

H. Production schedule--A listing of jobs to be run and the time period in which to run each job.

I. Programmer--A person who devises procedures which can be used by a computer, flow charts these procedures, writes instruction routines in a computer language, and later debugs these programs.

J. Security procedures--Procedures which insure that programs, data, input output, and computer operations are not available to unauthorized users.

K. Vendor--The company that supplies the computer or software.

II. Types of communications--The supervisory aspect of an operator requires that there be communication with a variety of people associated with the operation of the computer center. The operator may be responsible for communication with:

A. Programmers in order that system personnel might be informed and knowledgeable concerning matters of mutual interest.

B. Field service personnel to coordinate necessary preventive maintenance with production schedules to achieve maximum benefit from the computer system.

C. Vendors concerning current operating manuals and user directives.

D. Individuals who determine priorities and policies in order that work be done in accordance with designated importance.

E. Individuals who work as operators in order to assign duties for the most efficient use of personnel.

III. Necessary experiences and knowledge--An operator must be knowledgeable in many areas in order to perform well in a supervisory role. It may be necessary to have sufficient knowledge of the:

A. Equipment in the computer center, in order to recognize abnormal operation and to seek the proper person or reference to correct the problem.

B. Equipment in the computer center, in order to perform necessary routine maintenance on each device.

C. Necessary supplies and their rate of use, in order to maintain sufficient inventory for uninterrupted operation.

D. Operation of the computer center, in order to make a meaningful contribution toward development of maintenance and operating procedures.

E. Scheduling of preventive maintenance and the time necessary to accomplish the maintenance with minimum interruption.

F. Vendor manuals and their updates.

G. Scheduling and experience with center operation to monitor jobs pending and processed and most efficiently use the system.

H. Various services offered by the computer center, in order to effectively orient new users.

I. Computer center staff and their abilities, in order to effectively schedule and implement on-the-job training and reassign duties to personnel as changes occur.

IV. Security--As the use of computers continue to increase and with more record keeping, accounting, payroll, document preparation, and other related activities being done by the computer, the area of security has increased as an operator's responsibility. Some areas of security which the operator must be concerned about are:

A. Data stored on tapes, disks, floppy disks, and other media should be stored in a secure area and should be made available only to those designated as authorized users of the particular media.

B. Backups should be carefully maintained and stored securely in the event original copies are destroyed.

C. Output of any job should be available only to those authorized to review such output.

D. Discarded output from the computer center should be destroyed in a manner appropriate to the security needs of the center.

E. Only authorized users should have access to the system.

F. Programs should be made available only to those who have been designated to use particular programs.

SUPERVISION OF DATA PROCESSING FUNCTIONS

ASSIGNMENT SHEET #1--ROLE OF A COMPUTER OPERATOR

Either by visiting a computer center or from information received from a guest speaker, complete the following: (Write a report.)

1. MANUFACTURER AND MODEL OF COMPUTER IN COMPUTER CENTER BEING STUDIED
2. NUMBER OF PEOPLE EMPLOYED AS OPERATORS ON THIS SYSTEM
3. IF THERE ARE SEVERAL OPERATORS, HOW ARE THEIR DUTIES DIVIDED?
4. DESCRIBE THE MANNER IN WHICH THE PROGRAMMER AND THE OPERATOR WORK TOGETHER IN THIS ORGANIZATION.
5. DESCRIBE THE SYSTEM OF PRIORITIES AND METHOD OF SCHEDULING WORK ON THIS SYSTEM.
6. LIST THE SUPPLIES THAT THE OPERATOR MUST INVENTORY.
7. DESCRIBE SECURITY ON THE SYSTEM.
8. HOW OFTEN IS PREVENTIVE MAINTENANCE PERFORMED AND HOW IS IT SCHEDULED?

SUPERVISION OF DATA PROCESSING FUNCTIONS

TEST

MULTIPLE CHOICE: Circle the number of the correct answer.

a. A/an ? lists jobs to be run and the time period in which to run each job.

1. inventory
2. vending sheet
3. production schedule
4. time sheet

b. An operator may be responsible for communication with ? in order that system personnel might be informed and knowledgeable concerning matters of mutual interest.

1. programmers
2. operators
3. vendors
4. users

c. ? is performed periodically to check out the system and its components.

1. On-the-job training
2. Corrective surgery
3. Production scheduling
4. Preventive maintenance

d. The standard policies and situations under which a computer center operates are known as

1. computer security procedures.
2. computer operating procedures.
3. production scheduling procedures.
4. preventive operating procedures.

e. An area of security which one must be concerned with are the ? stored on tapes, disks, and other media.

1. policies
2. procedures
3. software
4. data

f. A ___?___ devises procedures which can be used by a computer.

1. programmer
2. operator
3. clerk
4. systems analyst

g. Operating manuals are supplied by the ___?___ on the specific use of a piece of hardware or software.

1. user
2. programmer
3. vendor
4. analyst

h. ___?___ work(s) with the ______ to coordinate the necessary preventive maintenance with production schedules.

1. Field service personnel, data entry clerk
2. Field service personnel, operator
3. Operator, field service personnel
4. Operator, programmer

i. ___?___ should be carefully maintained and stored securely in the event original copies are destroyed.

1. Manuals
2. Assignments
3. Outputs
4. Backups

j. A/An ___?___ is a complete listing of supplies on hand.

1. inventory
2. schedule
3. procedure book
4. backup file

SUPERVISION OF DATA PROCESSING FUNCTIONS

ANSWERS TO PRETEST

1. a. 3
   b. 1
   c. 6
   d. 4
   e. 2
   f. 11
   g. 9
   h. 7
   i. 5
   j. 10
   k. 8

2. Answers may appear in any order and should be similar to these:

   a. Programmers in order that system personnel might be informed and knowledgeable concerning matters of mutual interest.

   b. Field service personnel to coordinate necessary preventive maintenance with production schedules to achieve maximum benefit from the computer system.

   c. Vendors concerning current operating manuals and user directives.

   d. Individuals who determine priorities and policies in order that work might be done in accordance with designated importance.

   e. Individuals who work as operators in order to assign duties for the most efficient use of personnel.

3. Answers may be any of the following:

   a. Equipment in the computer center, in order to recognize abnormal operation and to seek the proper person or reference to correct the problem.

   b. Equipment in the computer center, in order to perform necessary routine maintenance on each device.

   c. Necessary supplies and their rate of use, in order to maintain sufficient inventory for uninterrupted operation.

   d. Operation of the computer center, in order to make a meaningful contribution toward development of maintenance and operating procedures.

INTRODUCTION TO PROBLEM ANALYSIS

UNIT OBJECTIVE

After completion of this unit, the student should be able to analyze and solve elementary programming problems. This knowledge will be evidenced by completion of assignments and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to problem analysis to the correct definitions.
2. List activities involved in problem analysis.
3. Determine variables required to solve a problem.
4. Determine formulas and calculations required to solve a problem.
5. Interpret decision tables.
6. Create decision tables.

PREREQUISITES

Basic Data Processing Concepts and Functions

Historical Development of Data Processing (optional)

Common Features of Data Processing Systems

Data Processing Applications and Careers (optional)

INTRODUCTION TO PROBLEM ANALYSIS

SUGGESTED ACTIVITIES

I. Instructor:

   A. Give pretest.

   B. Provide student with objective sheet.

   C. Provide student with information and assignment sheets.

   D. Make transparencies.

   E. Discuss unit and specific objectives.

   F. Discuss information and assignment sheets.

   G. Demonstrate the use of decision tables using TM 1 and TM 2. Be sure to point out the use of a "trip card" (clock number = 0, TM 2).

   H. Give test.

II. Student:

   A. Take pretest.

   B. Read objective sheet.

   C. Study information sheet.

   D. Complete assignment sheets.

   E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

   A. Objective sheet.

   B. Information sheet.

   C. Transparency masters: TM 1 - Blank Decision Table.

      TM 2 - Decision Table Example.

D. Assignment sheets: #1 - Interpret a Decision Table.

#2 - Determine Variables and Formulas.

#3 - Make a Decision Table.

E. Answers to assignment sheets.

F. Prestest and test.

G. Answers to pretest and test.

II. References

A. Conger, Daniel J. and Fred R. McFadden. A First course in Data Processing. Santa Barbara: John Wiley & Sons, Inc., 1977.

B. Sippl, Charles J. and Charles P. Sippl. Computer Dictionary and Hand book. Indianapolis: Howard W. Sams & Co., Inc., 1972.

C. Dock, Thomas V. and Edward Essick. Principles of Business Data Processing. Chicago: Science Research Associates, Inc., 1978.

D. References available at your school.

INTRODUCTION TO PROBLEM ANALYSIS

PRETEST

1. Match the terms on the right to the correct definition.

_____a. The maximum number of records that can be contained in a given unit (block) of tape.

_____b. A catch-all rule in a decision table designed to handle the conditions not covered by exact and explicit rules.

_____c. A symbol whose numeric value changes from one repetition of a program to the next, or may change within each repetition of a program.

_____d. A structured set of related files that is internally accessible to the computer.

_____e. Statements at the bottom half of a decision table which indicate the steps to be taken.

_____f. The process of logically organizing information which will be generated in producing a computer program into a useful file that continually reflects the current state of the program.

_____g. A generalized program within the operating system that performs necessary, but routine, jobs.

_____h. A constant or variable in mathematics that remains constant during some calculations.

_____i. The methodological investigation of a problem by a consistent procedure and its separation into related units for further detailed study.

_____j. A set of instructions that direct the computer to carry out a well-defined mathematical or logical operation.

1. Actions
2. Analysis
3. Blocking factors
4. Conditions
5. Data base
6. Decision table
7. ELSE rule
8. Flowchart
9. Formula
10. Looping
11. Parameter
12. Program documentation
13. Rules
14. Subroutine
15. Utility program
16. Variable

_____ k. A rule or principle expressed in algebraic symbols.

_____ l. Statements at the top half of a decision table which indicate the different stipulations to check for.

_____ m. A graphic presentation of the logic required to solve a problem.

_____ n. Columns of a decision table.

_____ o. A computer operation in which a sequence of steps is repeated.

_____ p. A graphic aid to problem solving, which lists conditions to be checked and the actions to be taken when these conditions are found.

2. List the activities involved in problem analysis.

   a.

   b.

   c.

3. a. Given the beginning monthly balance on a checking account, what other information would you need to calculate the ending balance at the end of the month (service charge is \$2.00 per month + \$.10 per check written)?

   b. Write the algebraic formula to calculate the amount of service charge.

   c. Write a formula to calculate the ending balance.

4. Given a data file with the following information,

   1. Stock Number 2. Inventory Amount

   Make a decision table according to the following specifications:

   A. Terminate program when the stock number is equal to zero.

   B. Print stock number and inventory amount.

   C. For stock numbers less than 100:

      1. Print "order stock" if inventory amount is less than 50.
      2. Print "over stock" if inventory amount is greater than 100.

   D. For stock numbers greater than 100 and less than 200:

      1. Print "order stock" if inventory amount is less than 50.
      2. Print "over stock" if inventory amount is greater than 150.

   E. For stock numbers greater than 200, print no message.

INTRODUCTION TO PROBLEM ANALYSIS

INFORMATION SHEET

I. Terms and definitions

A. Actions--Statements at the bottom half of a decision table which indicate the steps to be taken.

B. Analysis--The methodological investigation of a problem by a consistent procedure and its separation into related units for further detailed study.

C. Blocking factors--The maximum number of records that can be contained in a given unit (block) of tape.

D. Conditions--Statements at the top half of a decision table which indicate the different stipulations to check for.

E. Data base--A structured set of related files that is internally accessible to the computer and fundamental to a system.

F. Decision table--A graphic aid to problem solving, which lists conditions to be checked and the actions to be taken when these conditions are found.

G. ELSE rule--A catch-all rule in a decision table designed to handle the conditions not covered by exact and explicit rules.

H. Flowchart--A graphic presentation of the logic required to solve a problem.

I. Formula--A rule or principle expressed in algebraic symbols.

J. Looping--A computer operation in which a sequence of steps is repeated.

K. Parameter--A constant or a variable in mathematics that remains constant during some calculations.

L. Rules--Columns of a decision table. The unique group of conditons surrounding data elements.

M. Program documentation--The process of logically organizing information which will be generated in producing a computer program into a useful file that continually reflects the current state of the program; includes written test and flowcharts.

N. Subroutine--A group of instructions used a number of times in a program and can be called as needed.

O. Utility program--A generalized program within the operating system that performs necessary, but routine jobs.

P. Variable--A symbol whose value may change from one repetition of a program to the next, or may change within each repetition of a program.

II. Problem solving and programming

A. Define the problem.

The first step in solving a problem is to develop a clear and definite statement of the problem and what the objective and goals of the program are. Without this information, the time spent collecting data, flowcharting, establishing formats and procedures, programming, debugging, and testing may be a complete waste of both time and money. Since reductions in time and cost are two of the major objectives of data processing, it is absolutely imperative that this waste be eliminated. Programmers must work and communicate with both systems analysts and users to insure that the problem they are solving is exactly what the user wants.

B. Acquire data.

Once the problem has been properly defined, the next step is the acquistion of data. The programmer must determine what data will be needed and where it will come from. Once the programmer knows what data will be used, he or she must establish the input and output formats which would best suit the purpose. This will also require the determination of how the data will be stored. If it is to be stored on tape or disk, the blocking factors must be established.

C. Problem structure.

The third phase in problem solving is to establish formulas, calculations, and other procedures needed to produce the required results. The programmer must also determine the sequence in which the procedures must be performed.

III. Decision tables and flowcharts (TM 1 and TM 2-1, 2-2)

A programmer can use both decision tables and flowcharts to help organize ideas and show the necessary procedures and sequencing. A flowchart is a graphic representation of a sequence of events. A decision table also shows the sequence of events but is more useful when there are many possible conditions. A decision table lists the conditions to be tested for, the possible results of each condition test, and the actions to be taken when a given set of conditions are found.

IV. Write the program

Once the programmer has determined exactly what the program must contain, he or she can then check to see if there is an existing utility program which can be used or modified to meet the present problem. Subroutines may also be examined to see if they can simplify the coding procedure. The reason for checking utility programs and suboutines is to cut down on the time required to develop a new program.

DECISION TABLE FORMAT

RULES

	1	2	3	ELSE
CONDITIONS	CONDITION		ENTRIES	
ACTIONS	ACTION		ENTRIES	

CONDITIONS -- A LIST OF ALL POSSIBLE RESPONSES

CONDITION ENTRIES -- THE ACTUAL RESPONSES FOUND

ACTIONS -- A LIST OF ALL POSSIBLE TASKS TO BE PERFORMED

ACTION ENTRIES -- THE ACTUAL TASKS TO BE PERFORMED BASED ON THE CONDITIONS FOUND UNDER A GIVEN RULE

RULES -- THE COLUMNS WHICH REPRESENT A SET OF CONDITIONS

ELSE RULES -- A CATCH-ALL RULE DESIGNED TO HANDLE CONDITIONS NOT COVERED BY ANOTHER RULE

IPA 10

DECISION TABLE EXAMPLE

CONDITIONS	RULES 1	2	3	4
1. CLOCK NUMBER = 0	YES			
2. GROSS PAY LESS THAN $2,000		YES		
3. GROSS PAY MORE THAN $2,000, LESS THAN $5,000			YES	
4. GROSS PAY EQUAL TO OR GREATER THAN $5,000				YES
1. COMPUTE TAX: 1A. ZERO TAX		X		
1B. 2% OF THE EXCESS OVER $2,000			X	
1C. $60 PLUS 5% OF THE EXCESS OVER $5,000				X
2. CALCULATE NET PAY		X	X	X
3. PRINT: CLOCK NUMBER, GROSS PAY, TAX, NET PAY		X	X	X
4. TERMINATE PROGRAM	X			

EXPLANATION

RULE 1. THE FIRST CONDITION TO BE TESTED IS WHETHER OR NOT THE CLOCK NUMBER IS EQUAL TO ZERO--IF IT IS, THE ACTION TO BE TAKEN IS TO TERMINATE THE PROGRAM.

RULE 2. THE SECOND SET OF CONDITIONS IS FOUND WHEN THE CLOCK NUMBER IS NOT EQUAL TO ZERO AND THE GROSS PAY IS LESS THAN $2,000--THE ACTIONS TO BE TAKEN ARE: 1. COMPUTE TAX USING 1A, 2. CALCULATE NET PAY, AND 3. PRINT CLOCK NUMBER, GROSS PAY, TAX AND NET PAY.

RULE 3. THE THIRD RULE IS TRUE WHEN CLOCK NUMBER IS NOT EQUAL TO ZERO AND GROSS PAY IS BETWEEN $2,000 AND $5,000--ACTIONS TO BE TAKEN ARE: 1. COMPUTE TAX USING 1B, 2. CALCULATE NET PAY, AND 3. PRINT CLOCK NUMBER, GROSS PAY, TAX, AND NET PAY.

RULE 4. FOUND WHEN CLOCK NUMBER NOT EQUAL TO ZERO AND GROSS IS GREATER THAN $5,000--ACTIONS TO BE TAKEN ARE: 1. COMPUTE TAX USING 1C, 2. CALCULATE NET PAY, AND 3. PRINT CLOCK NUMBER, GROSS PAY, TAX, AND NET PAY.

INTRODUCTION TO PROBLEM ANALYSIS

ASSIGNMENT SHEET #1--INTERPRET A DECISION TABLE

Using the decision table on the next page, answer the following questions:

1. When will the program be terminated? How will the program provide for termination?
2. Which employees will get a $50 bonus?
3. Which employees will get a two week vacation?
4. Which employees will get one week of vacation?
5. What actions are to be taken for female employees that work in department number 23?
6. What actions are to be taken for male employees with deduction code D working in department number 25?
7. What actions are to be taken for female employees with deduction code C working in department number 25?
8. How are the conditions different in rules 3 and 5?
9. Which employees will have their records reviewed for a pay raise?
10. If there was a rule 6, which was an "ELSE" rule, what type of conditions would it be used for?

INTRODUCTION TO PROBLEM ANALYSIS

ASSIGNMENT SHEET #1--INTERPRET A DECISION TABLE (continued)

Using the data provided in the decision table below, answer the questions on the preceding page.

CONDITIONS			RULES		
	1	2	3	4	5
1. Employee Number = 0	Yes				
2. Sex		M	M	F	M or F
3. Department Number		23	25	23	25
4. Deduction Code		D	C	C	D
5. Hourly Pay at Least $8.00		Yes	Yes	Yes	No
ACTIONS					
1. Print Emp.No., Dept.No., Sex		X	X	X	X
2. Print One Week Vacation		X		X	X
3. Print Two Weeks Vacation			X		
4. Review Records for Pay Raise					X
5. Print $50 Bonus Check			X		X
6. Terminate Program	X				

INTRODUCTION TO PROBLEM ANALYSIS

ASSIGNMENT SHEET #2--DETERMINE VARIABLES AND FORMULAS

When presented with a problem to solve, the programmer's first step is to determine what variables are involved in the problem and what formulas, if any, are required to get the desired results. A variable is a data symbol whose value can change from one repetition of a program to the next. For example, assume that you want to find the average weight of 25 students in your class. Your weight probably differs from the weight of the student sitting next to you and so on. The variable in this case would be "student weight". In some problems, more than one variable may be involved--height and weight, for example.

A formula is a rule or principle expressed in algebraic symbols. For example, how would you go about finding the average weight of pupils in your class? Your answer, of course, is to add up the 25 students' weights, giving a total, and then divide that total by the number of pupils (25). Algebraically, you could express that rule as follows:

$$\text{Average weight} = \frac{\text{Weight}_1 + \text{Weight}_2 + \text{Weight}_3 + \ldots + \text{Weight}_{25}}{25}$$

Now apply what you have learned about variables and formulas to answer the following questions about time, distance, and speed.

You are given the following information:

Distance: Knoxville to Memphis---400 miles

Speed of five different drivers: Driver A: 50 mph
Driver B: 55 mph
Driver C: 57 mph
Driver D: 60 mph
Driver E: 65 mph

1. What variables are given in the above data (review the definition of a variable)?

   ____

2. How would you go about finding the time required for each driver to drive from Knoxville to Memphis?______________________________________

   ____

   ____

3. How would this be expressed in an algebraic formula?

   ____

4. Now assume that you have estimated the time required for the five drivers. Is time a variable in this case?_____

5. How would you determine the average time required to drive from Knoxville to Memphis, based on the performances of Drivers A through E?

6. What is the algebraic formula for the average time required to drive from Knoxville to Memphis for the five drivers?

INTRODUCTION TO PROBLEM ANALYSIS

ASSIGNMENT SHEET #3--MAKE A DECISION TABLE

Before starting this assignment, review TM I and TM 2 and also review your Assignment Sheet #1 about interpreting decision tables.

Assume that you have a set of data which contains the following information:

1. Student name
2. Number of credit hours taken
3. Class (represented by a code number)

    1 = Freshman
    2 = Sophomore
    3 = Junior
    4 = Senior
    5 = Graduate student

4. Grade point average

The program that will eventually be written is to do the following:

1. Terminate program when Class = 0.
2. If a graduate student, print nothing.
3. If a freshman, sophomore, junior, or senior:
    A. Print student name
    B. Print class
    C. Print GPA
    D. If full-time (12 or more hours):
        (1) Print "Highest Honors" if GPA $\geq$ 3.75
        (2) Print "High Honors" if $3.25 \leq \text{GPA} < 3.75$
        (3) Print "Honors" if $3.00 \leq \text{GPA} < 3.25$

1. What are the conditions in this problem? ____________________

____

____

____

____

____

____

____

2. What are the actions to be taken?

3. Construct the decision table for this problem.

INTRODUCTION TO PROBLEM ANALYSIS

ANSWERS TO ASSIGNMENT SHEET #1--INTERPRET A DECISION TABLE

1. The program would be terminated when the employee number is equal to 0. The card containing a "0" as an employee number serves as a "trip card"; that is, its only function is to be placed at the end of the data file to indicate that all the data has been processed and that execution should be terminated.

2. The following employees will get a $50 bonus check:

    (1) Males in Dept. 25 with a deduction code of "C" and hourly pay of at least $8.00.

    (2) Males and females in Dept. 25 with a deduction code of "D" and hourly pay of less than $8.00.

3. The following employees will get a two-week vacation:

    (1) Males in Dept. 25 with a deduction code of "C" and hourly pay of at least $8.00.

4. The following employees will get a one-week vacation:

    (1) Males in Dept. 23 with a deduction code of "D" and an hourly rate of at least $8.00.

    (2) Females in Dept. 23 with a deduction code of "C" and an hourly rate of at least $8.00.

    (3) Males or females in Dept. 25 with a deduction code of "D" and an hourly rate of less than $8.00.

5. (1) Print: employee number, dept. number, sex.
    (2) Print: one-week vacation.

6. (1) Print: employee number, dept. number, sex.
    (2) Print: one-week vacation.
    (3) Review records for pay raise.
    (4) Print: $50 bonus check.

7. No employees fit that description.

8. (1) Rule 5 includes females and Rule 3 does not.
    (2) Rule 3 has a deduction code of "C", while Rule 5 has a deduction code of "D".
    (3) Rule 3 has an hourly rate of at least $8.00, while Rule 5 has an hourly rate of less than $8.00

9. The following employees will have their records reviewed for a pay raise:

    (1) Males and females in Dept. 25 with a deduction code of "D" and an hourly rate of less than $8.00

10. It could be used to represent employees who don't fit into any of the four categories; for example, the employees described in question 7.

INTRODUCTION TO PROBLEM ANALYSIS

ANSWERS TO ASSIGNMENT SHEET #2--DETERMINE VARIABLES AND FORMULAS

1. Speed, distance.
2. Divide total miles (400) by the speed of the five drivers.
3. $\text{Time} = \frac{\text{Distance}}{\text{Speed}}$
4. Yes
5. Add the five times, giving a total. Then divide that total by 5.
6. $\text{Average} = \frac{\text{Time}_A + \text{Time}_B + \text{Time}_C + \text{Time}_D + \text{Time}_E}{5}$

INTRODUCTION TO PROBLEM ANALYSIS

ANSWERS TO ASSIGNMENT SHEET #3--MAKE A DECISION TABLE

(Answers may vary, and reasonable answers should be counted as correct).

1. Conditions:
    1. Class = 0
    2. Class
    3. At least 12 hours
    4. 3.00 ≤ GPA < 3.25
    5. 3.25 ≤ GPA < 3.75
    6. GPA ≤ 3.75

2. Actions:
    1. Print student name
    2. Print class
    3. Print GPA
    4. A. Print "Highest Honors"
        B. Print "High Honors"
        C. Print "Honors"
    5. Terminate Program

Rules

	1	2	3	4	5	6
3. Conditions						
1. Class = 0	Yes					
2. Class		5	1-4	1-4	1-4	1-4
3. At least 12 hours			Yes	Yes	Yes	No
4. 3.00 ≤ GPA < 3.25			Yes			
5. 3.25 ≤ GPA < 3.75				Yes		
6. GPA ≤ 3.75					Yes	
Actions						
1. Print student name			X	X	X	X
2. Print class			X	X	X	X
3. Print GPA			X	X	X	X
4. A. Print "Highest Honors"					X	
B. Print "High Honors"				X		
C. Print "Honors"			X			
5. Terminate Program	X					

INTRODUCTION TO PROBLEM ANALYSIS

TEST

1. TRUE OR FALSE: Using "T" or "F", indicate if the following statements are true or false.

_____a. A symbol whose value may change from one repetition of a program to the next, or within each repetition of a program, is called a flowchart.

_____b. Actions should be listed at the top half of a decision table.

_____c. Program documentation describes every phase of the programming cycle, including facts about the program being produced.

_____d. A computer operation in which a sequence of steps is repeated is called a loop.

_____e. Flowcharts present graphically the logic required to solve a problem.

_____f. The different columns of a decision table refer to different rules or unique groups of conditions surrounding data elements.

_____g. A subroutine is a set of related files that is internally accessible to the computer.

_____h. Decision tables list conditions to be checked for and actions to be taken when these conditions are found.

_____i. A parameter is a catch-all rule in a decision table designed to handle the conditions not covered by exact and explicit rules.

_____j. Rules refer to the maximum number of records that can be contained in a given unit (block) of tape.

_____k. Else rules refer to constants or variables in mathematics that remain constant during calculations.

_____l. A subroutine is a set of instructions which directs the computer to carry out a well-defined mathematical or logical operation.

_____m. Formulas express rules or principles in algebraic terms.

_____n. Problem analysis involves separating a problem into related units for further detailed study.

_____o. Utility programs are generalized programs within the operating system which perform necessary, but routine, jobs.

_____p. Statements at the top half of a decision table indicate the differenct conditions to be checked for.
for.

2. MULTIPLE CHOICE: Circle the number of the correct answer.

a. Which of the following activities is not involved in problem analysis?

1. Defining the problem
2. Coding computer instructions
3. Establishing formulas and calculations
4. Gathering information

Questions b and c refer to analyzing a checking account. Assume you are given a beginning monthly balance.

b. Which of the following information would not be necessary to calculate the end of the month balance?

1. Savings account balance
2. Total deposits
3. Number of checks written
4. Total amount of checks written

c. If the standard service charge is \$2.00 + 10 cents per check written, which of the following formulas is correct?

1. Service charge = \$2.10 + number of checks.
2. Service charge = \$2.00 + (\$.10 x number of checks).
3. Service charge = \$2.00 - (\$.10 x number of checks).
4. Service charge = \$2.20 x number of checks.

Questions d - f refer to the following decision table:

Conditions:	1	2	3	4	5	ELSE
1. Stock number = 0	X					
2. Stock number $\leq$ 100		X	X			
3. Stock number greater than 100, less than 200				X	X	
4. Inventory amount less than 50		X		X		
5. 100 $\leq$ inventory amount $\leq$ 150			X			
6. Inventory amount > 150			X		X	
Actions:						
1. Print stock number		X	X	X	X	X
2. Print inventory amount		X	X	X	X	X
3. Print "Order Stock"		X		X		
4. Print "Over Stock"			X		X	
5. Terminate Program	X					

d. When is the program terminated?

1. When stock number < 100
2. When inventory amount > 150
3. When "order stock" is printed
4. When stock number = 0

e. Under the "ELSE" rule:

1. the program terminates.
2. "over stock" is printed.
3. stock number and inventory amount are printed.
4. stock number is usually equal to zero.

f. "Order Stock" is printed when:

1. condition 2 and 4; or condition 3 and 4 are true.
2. condition 2, 5 and 6; or condition 3 and 6 are true.
3. condition 2, 3, and 4 are true.
4. condition 2, 3, or 6 are true.

INTRODUCTION TO PROBLEM ANALYSIS

ANSWERS TO PRETEST

1. a. 3
   b. 7
   c. 16
   d. 5
   e. 1
   f. 12
   g. 15
   h. 11
   i. 2
   j. 14
   k. 9
   l. 4
   m. 8
   n. 13
   o. 10
   p. 6

2. a. Define the problem.

   b. Acquire data (gather necessary information).

   c. Problem structure (establish formulas, calculations, and procedures needed).

3. Answers may vary, and any reasonable answers should be counted as correct.

   A. Total checks written
   Total deposits
   Number of checks written
   Service charge

   B. Service charge = \$2.00 + (\$.10 X number of checks)

   C. Ending balance = Beginning Balance + Total Deposits - Total Checks - Service Charge.

4. Answer to question on back of page.

4. Answers may vary, and other reasonable answers should be counted as correct.

Conditions:	1	2	3	4	5	ELSE
1. Stock number = 0	X					
2. Stock number < 100		X	X			
3. Stock number greater than 100, less than 200				X	X	
4. Inventory amount less than 50		X		X		
5. $100 \leq$ inventory amount ≤ 150			X			
6. Inventory amount ≤ 150			X		X	
Actions:						
1. Print stock number		X	X	X	X	X
2. Print inventory amount		X	X	X	X	X
3. Print "Order Stock"		X		X		
4. Print "Over Stock"			X		X	
5. Terminate Program	X					

INTRODUCTION TO PROBLEM ANALYSIS

ANSWERS TO TEST

1. True or False.

   a. F
   b. F
   c. T
   d. T
   e. T
   f. T
   g. F
   h. T
   i. F
   j. F
   k. F
   l. T
   m. T
   n. T
   o. T
   p. T

2. Multiple Choice.

   a. 2
   b. 1
   c. 2
   d. 4
   e. 3
   f. 1

INTRODUCTION TO FLOWCHARTING

UNIT OBJECTIVE

After completion of this unit, the student should be able to construct a simple flowchart with no errors. Knowledge will be evidenced by completion of the assignment sheets and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to flowcharting to their correct definitions.
2. Identify standard flowcharting symbols by their functions.
3. List, in proper sequence, steps used to solve a problem.
4. Construct a flowchart.
5. Desk-check the logical validity of a flowchart.

PREREQUISITES

Basic Data Processing Concept and Functions

Historical Development of Data Processing (optional)

Common Features of Data Processing Systems

Data Processing Applications and Careers (optional)

Introduction to Problem Analysis

INTRODUCTION TO FLOWCHARTING

SUGGESTED ACTIVITIES

1. Instructor:

   A. Give pretest.

   B. Provide student with objective, information, and assignment sheets.

   C. Make transparencies.

   D. Discuss unit and specific objectives.

   E. Discuss information and assignment sheets.
   NOTE: Examples are given in this module using and not using connectors. If you have a preference, this should be pointed out to students and examples should be revised.

   F. Discuss TM 1 and TM 2.

   G. Demonstrate desk-checking, or "walking through", a flowchart.

   H. Discuss the difference between system and program flowcharts. Students should be familiar with what a system flowchart is, but systems flowcharting is beyond the scope of this module.

   I. Give test.

II. Student:

   A. Take pretest.

   B. Read objective sheet.

   C. Study information sheet.

   D. Using the transparency masters as references, complete assignment sheet.

   E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

   A. Objective sheet.

   B. Information sheets.

C. Transparency masters: TM 1 - Flowcharting Symbols

TM 2 - Flowchart Example

D. Assignment sheets: #1 - Use Flowcharting Symbols

#2 - Develop Problem Logic Sequence

#3 - Construct a Flowchart

#4 - Desk-check a Flowchart

E. Answers to assignment sheets.

F. Pretest and test.

G. Answers to pretest and test.

II. References:

A. Cougar, J. Daniel and Fred R. McFadden. A First Course in Data Processing. Santa Barbara: John Wiley & Dons, Inc., 1977.

Cougar & Shannon. FORTRAN IV: A.P.I. Approach Including Structured Programming. Richard D. Irwin, Inc., 1976.

C. Dock, V. Thomas and Edward Essick. Principles of Business Data Processing, third edition. Chicago: Science Research, Inc., 1978.

D. Silver and Silver. Introduction to Programming: Programming Logic and Flowcharting. McGraw-Hill Book Company, 1977.

E. Sippl, Charles J. and Charles P. Sippl. Computer Dictionary and Handbook. Indianapolis: Howard W. Sams, & Co., Inc., 1972.

F. Wu, William C. Business Programming in FORTRAN IV. Brown Company Publishers, 1977.

G. References available in your school.

INTRODUCTION TO FLOWCHARTING

PRETEST

1. Match the terms on the right to the correct definitions.

    ____a. Order of succession; in flowcharting, steps following one after the other.

    ____b. The repeating of a sequence of instructions.

    ____c. The end of the set of functions in a flowchart.

    ____d. The beginning of the set of functions in a flowchart.

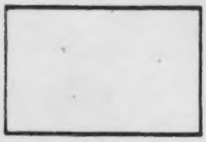
    ____e. A graphic presentation of the logic required to solve a problem.

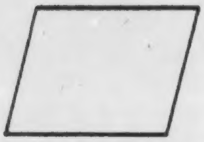
    ____f. In flowcharting, the choice of an alternative action based on a condition.

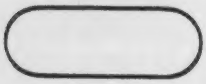
    ____g. The process of visually checking each step of a flowchart for the purpose of eliminating errors.

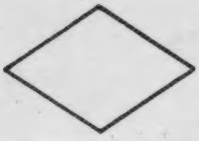
    1. Decision
    2. Desk-check
    3. Flowchart
    4. Initialization
    5. Looping
    6. Sequence
    7. Termination

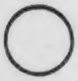
2. Identify the following flowcharting symbols by writing their functions in the space provided.

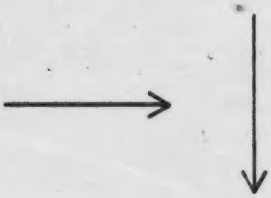
a.

____

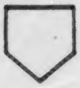
b.

____

c.

____

d.  ______________________________

e.  ______________________________

f.  ______________________________

g.  ______________________________

3. List, in proper sequence, the steps to read the values for B and C, and then find and print the value of A in the formula:

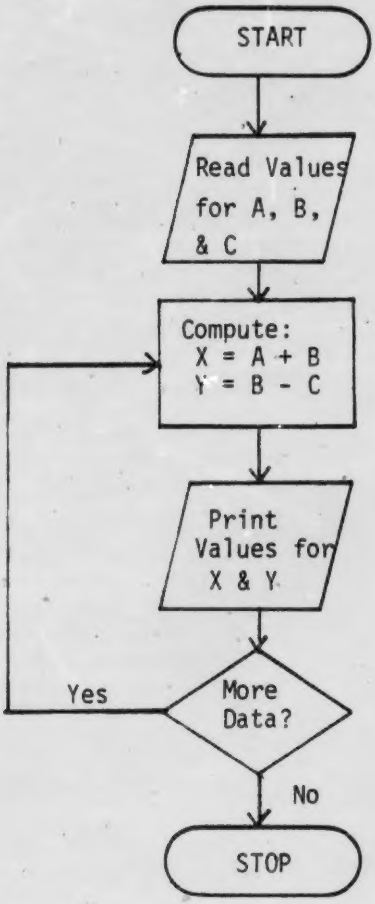
$A = \underline{\ B + C\ }\ B - C$

Assume that you have only one value for B and one value for C.

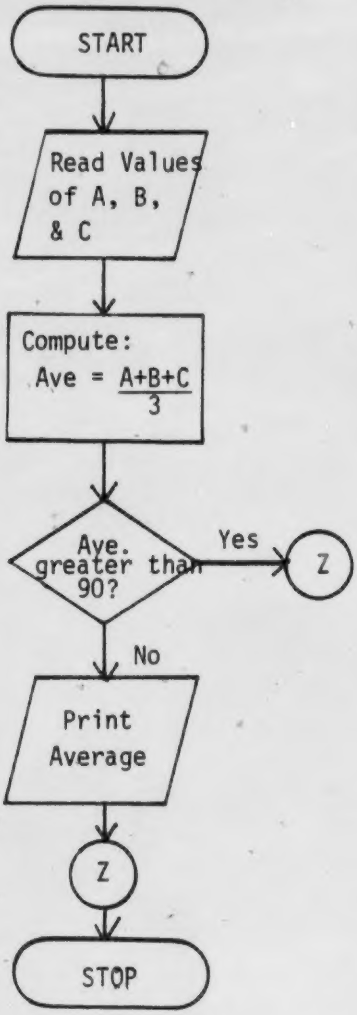
4. Construct a flowchart for the steps determined in question 3.

5. Desk-check the logical validity of the following flowcharts and write either "valid" or "invalid" in the space provided. If the flowchart is invalid, explain why.

a. The purpose of this problem is to compute values for X and Y based on given values for A, B, and C.


START
Read Values for A, B, & C
Compute: X = A + B Y = B - C
Print Values for X & Y
More Data?
Yes
No
STOP

b. The purpose of this problem is to read in values of 3 numbers named A, B, and C, average them, and print the average, if it is greater than 90.


START
Read Values of A, B, & C
Compute: Ave = A+B+C / 3
Ave. greater than 90?
Yes
Z
No
Print Average
Z
STOP

INTRODUCTION TO FLOWCHARTING

INFORMATION SHEET

I. Terms and definitions

A. Decision--In flowcharting, the choice of an alternative action based on a condition.

B. Desk-check--In flowcharting, the process of visually checking each step of a flowchart for the purpose of eliminating errors (primarily logic errors.).

C. Flowchart--A graphic presentation of the logic required to solve a problem. Flowcharts are language independent; that is, the same flowchart can be used to code a program in any programming language.

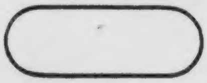
D. Initialization--The beginning of the set of functions in a flowchart.

E. Looping--The repeating of a sequence of instructions.

F. Sequence--Order of succession; in flowcharting, steps following one after the other.

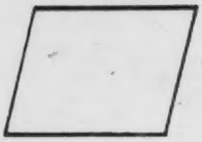
G. Termination--The end of the set of functions in a flowchart.

II. Flowcharting symbols (See TM 1)

A.  Terminal activity
(initialize or terminate)

The terminal symbol shows the beginning and ending points in a program. It always symbolizes the first (START) and last (END) elements on the flowchart. STOP inside a terminal...terminal symbol indicates the end of the program and that the program is to terminate execution.

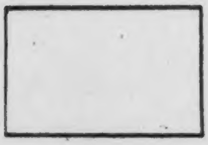
Example: (See TM 2)

B.  Input/Output

A parallelogram is used to represent an input or output operation. It shows the points in a program where data is made available, or where it is output.

Examples: Read code number, print report.

C.

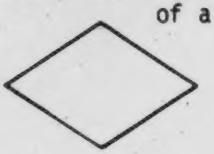


Process (where data is changed or manipulated)

A rectangle indicates that a change in the form or value of data will occur, or that an operation or process is to be performed. The process symbol is used to show mathematical calculations or to manipulate data in any way.

Examples: Calculate sales tax, find square root, initialize the value of a variable (A = 2).

D.

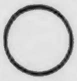


Decision

A diamond shows that a conditional branch has been reached. It indicates that this is a decision point of the program flow and that the program is to select one of several pathways, depending on the condition specified. It may be a two-way branch or have three branches.

Examples: Branch to one of two paths, depending on whether the temperature is 100° C or more, or less than 100° C. Branch to path A, B, or C depending on an account number read in.

E.

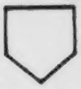


On-page connector

Two small circles are used to connect separated portions of a flowchart on the same page without drawing lines between the parts. They show that a flowline transfers to another point in the chart. These symbols are used when it would be difficult or confusing to draw a flowline between two symbols. One connector indicates where the flow breaks off; the other, where it resumes. The same key, letter, word, number, or name is used in both connectors to show their relationahip. Arrowheads show the direction. Connectors are also used to indicate the point at which one or more flowlines branch to the same point.

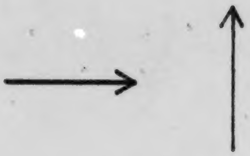
Examples: Connectors may show program flow continuing from the bottom of one column of symbols to the top of the next column. Connectors can indicate the return of program flow to a read routine from several alternative places in the program (See connectors used in TM 2).

F.



Off-page connector

Two of the above symbols are used to connect separated portions of a flowchart which are on different pages without drawing confusing lines from one page to another. The same rules apply for on-page connectors (see E) and off-page connectors.

G.  Direction of arrow shows flow of logic

A straight line between two boxes shows the path of logic in a program. It shows the order in which operations are to be performed and, therefore, indicates the points at which different data has been calculated or processed. An arrowhead on the line shows the direction of flow. Unless indicated otherwise, it is assumed that the flowchart flows from top to bottom, and from left to right.

Example: (See TM 2)

III. Flowcharting guidelines

A. Use standard flowcharting symbols.

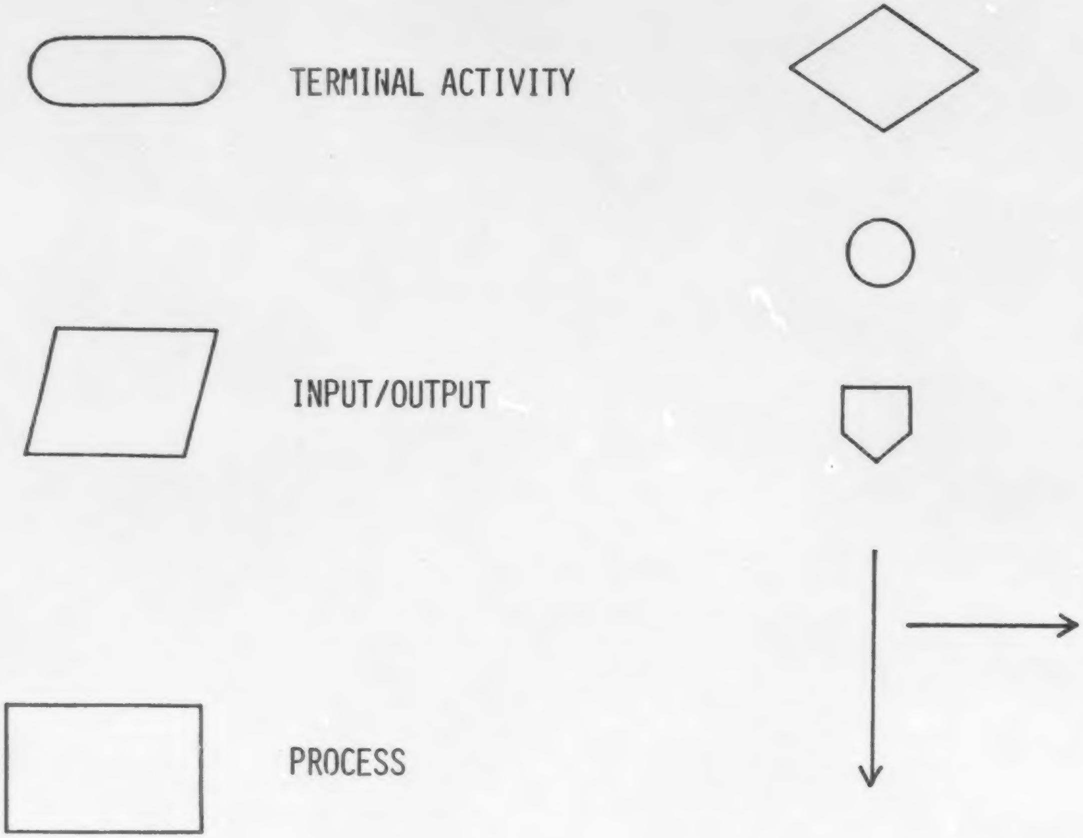
B. Develop machine-independent flowcharts and evaluate logic before reducing to machine-dependent flowcharts.

C. Try to keep flow of logic from top to bottom and from left to right.

D. Avoid intersection of lines used to depict flow of logic.

E. Use connectors to reduce the number of flow lines.

FLOWCHARTING SYMBOLS



TERMINAL ACTIVITY

INPUT/OUTPUT

PROCESS

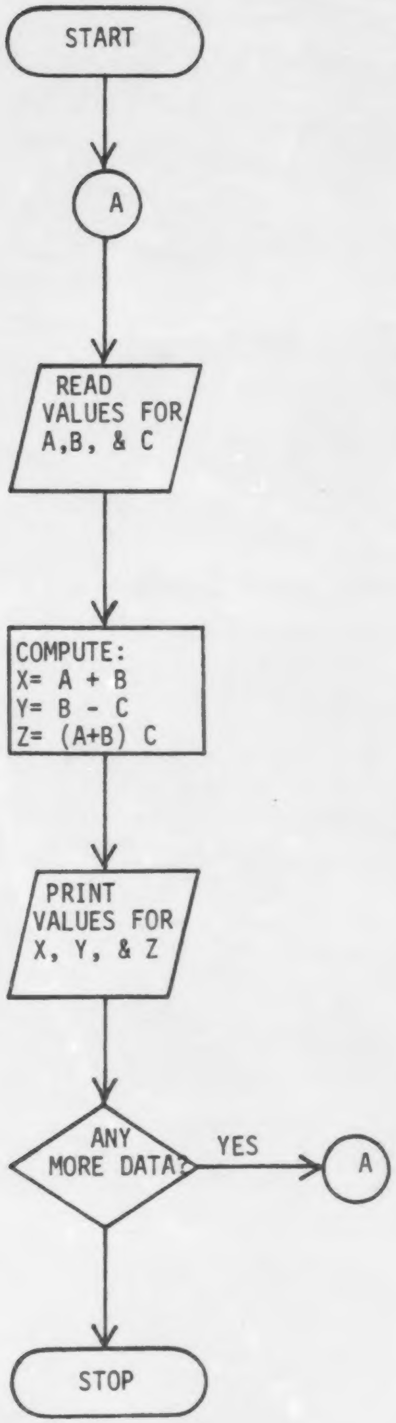
DECISION

ON-PAGE CONNECTOR

OFF-PAGE CONNECTOR

DIRECTION OF ARROW
SHOWS FLOW OF LOGIC

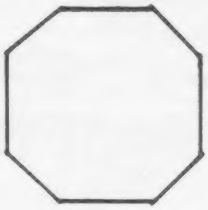
FLOWCHART EXAMPLE


START
A
READ VALUES FOR A,B, & C
COMPUTE:
X= A + B
Y= B - C
Z= (A+B) C
PRINT VALUES FOR X, Y, & Z
ANY MORE DATA?
YES
A
STOP

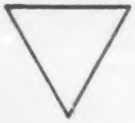
INTRODUCTION TO FLOWCHARTING

ASSIGNMENT SHEET #1--USE FLOWCHARTING SYMBOLS

Imagine for a moment that you are driving a car. You see a sign ahead, but aren't close enough to read it. You can, however, make out the shape. What is this sign telling you to do?



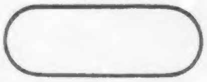
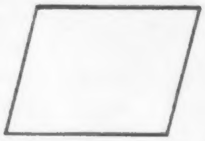
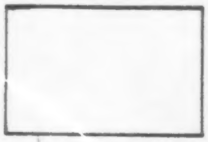
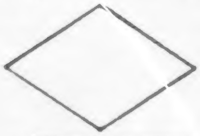
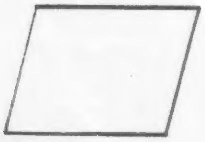
How about this one?



If you answered STOP and YIELD, you were correct. The shapes of traffic signs indicate the performance expected just as the words STOP and YIELD do.

Flowcharting symbols work the same way. The different symbol shapes indicate the different types of activities to be performed to solve a problem.

A. In the following exercise, refer to your information sheet and indicate correct activity and symbol. The first five have been answered for you to get you started. Since connectors and arrows are used only to make flowcharts easier to read and follow, they are not used in this exercise.

Instruction	Type of Activity	Symbol
1. Start	terminal activity	
2. Read in price per pound and number of pounds purchased.	input	
3. Compute cost (lbs. X price)	process	
4. Check to see if cost is greater than $20.	decision	
5. Print the cost	output	

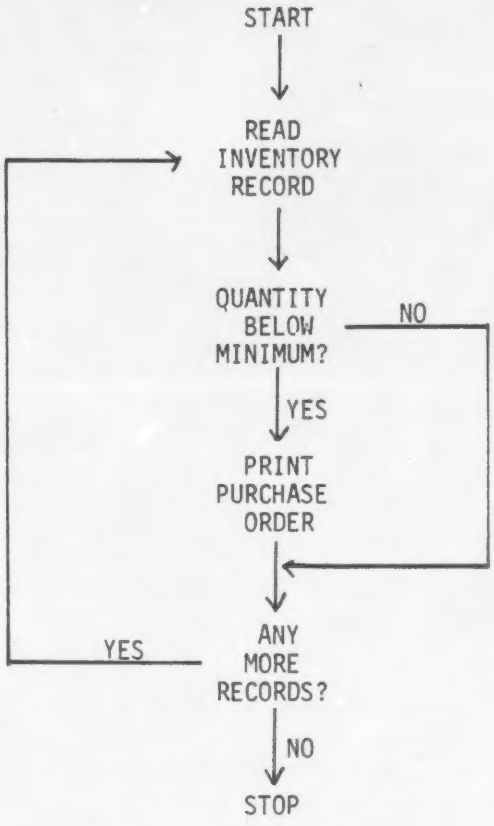
IF 14

Note that when the decision symbol is used, the instruction is to select one of several pathways, or alternatives, depending on the condition specified (See example--TM 2). Now, complete the remainder of the exercise.

Instruction	Type of Activity	Symbol
6. Write column headings		
7. Cost = $00.00?		
8. Yardage = Depth X Width		
9. Read name, depth, width, cost		
10. Write name, yardage, price		
11. Sum = K + 1		
12. Read a value		

Instruction	Type of Activity	Symbol
13. Value greater than 0?		
14. Let B = 3.74		
15. Stop		

B. Draw the appropriate flowcharting symbols for these steps to check inventory records and print purchase orders if necessary.


START
READ INVENTORY RECORD
QUANTITY BELOW MINIMUM?
NO
YES
PRINT PURCHASE ORDER
ANY MORE RECORDS?
YES
NO
STOP

INTRODUCTION TO FLOWCHARTING

ASSIGNMENT SHEET #2--DEVELOP PROBLEM LOGIC SEQUENCE

The first step in constructing a flowchart is to list the steps needed to solve a problem. For example, the following steps would be used to calculate and print the selling price based on a 6% sales rate.

1. Read the purchase price.
2. Calculate tax (Price X .06)
3. Calculate total price (Purchase price + tax)
4. Print total price.
5. Last record? If it is, stop. If not, go back to step 1.

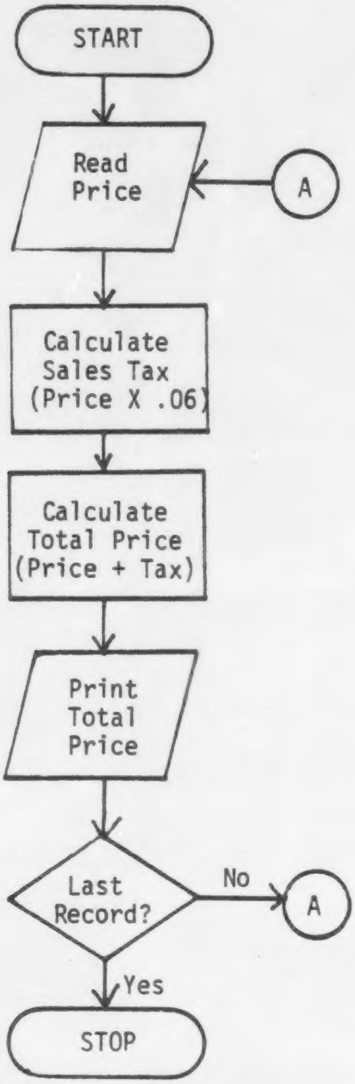
Now list the steps you would use to compute and print the average of three test scores for a class:

INTRODUCTION TO FLOWCHARTING

ASSIGNMENT SHEET #3--CONSTRUCT A FLOWCHART

Now you are ready to actually construct a flowchart. Study the flowchart below for the sales tax example in Assignment Sheet #2, and then construct your flowchart for the steps you listed to average three test scores.

Sales Tax example:


START
Read Price
A
Calculate Sales Tax (Price X .06)
Calculate Total Price (Price + Tax)
Print Total Price
Last Record?
No
A
Yes
STOP

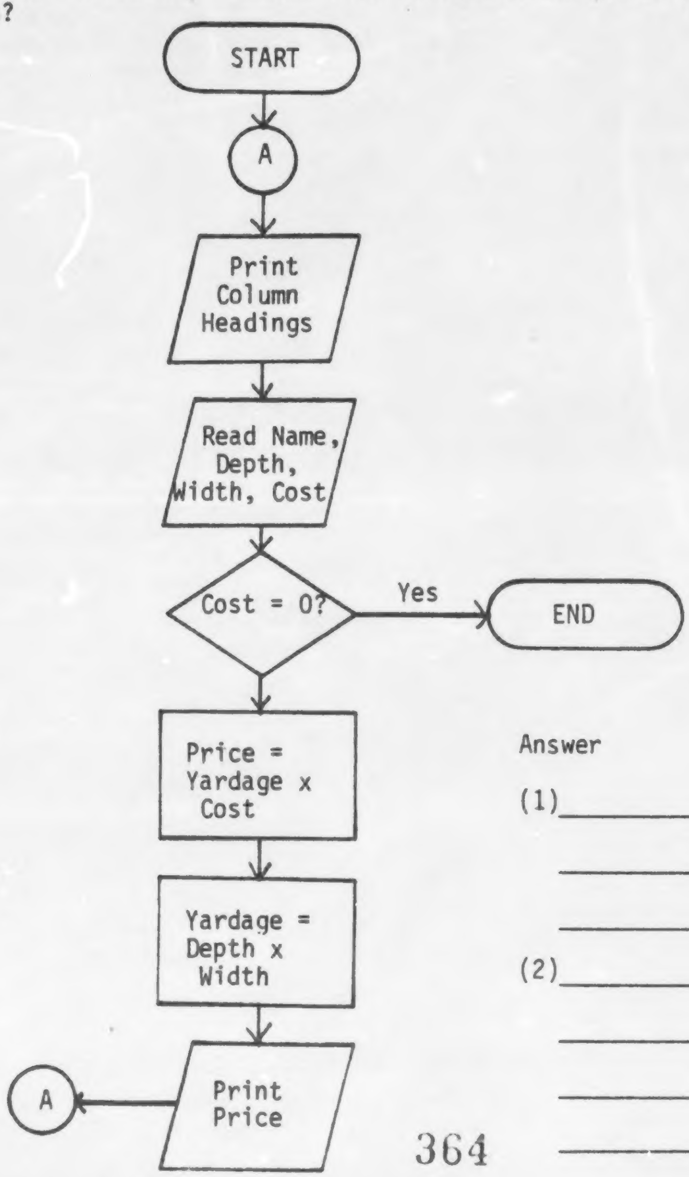
Construct a flowchart for the steps you listed to compute and print the average of three test scores for a class:

INTRODUCTION TO FLOWCHARTING

ASSIGNMENT SHEET #4--DESK-CHECK A FLOWCHART

The last step in the flowcharting process is to desk-check the validity of your work. This is done by visually checking each step of the flowchart for the purpose of eliminating errors (primarily logic errors). Think of it as "walking through" your flowchart to make sure that it accomplishes what it is supposed to do. This is a very important step and can prevent many problems when you actually start to code your program.

What is wrong with the following flowchart to calculate and print the price of building materials?


START
A
Print Column Headings
Read Name, Depth, Width, Cost
Cost = 0?
Yes
END
Price = Yardage x Cost
Yardage = Depth x Width
Print Price
A

Answer

(1)____________________

____

____

(2)____________________

____

____

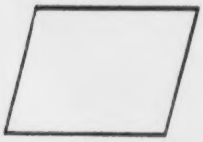
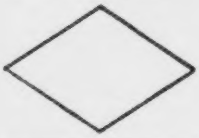
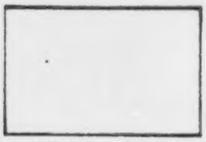
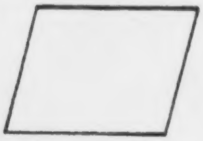
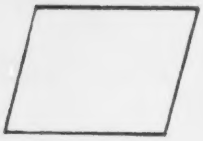
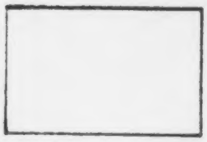
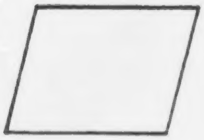
____

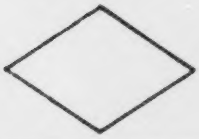
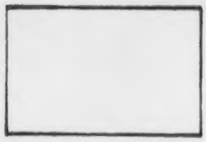
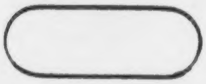
IF 19

Now desk-check the flowchart you constructed in Assignment Sheet #3. It would also be good practice for you to trade flowcharts with a classmate and desk-check each other's work.

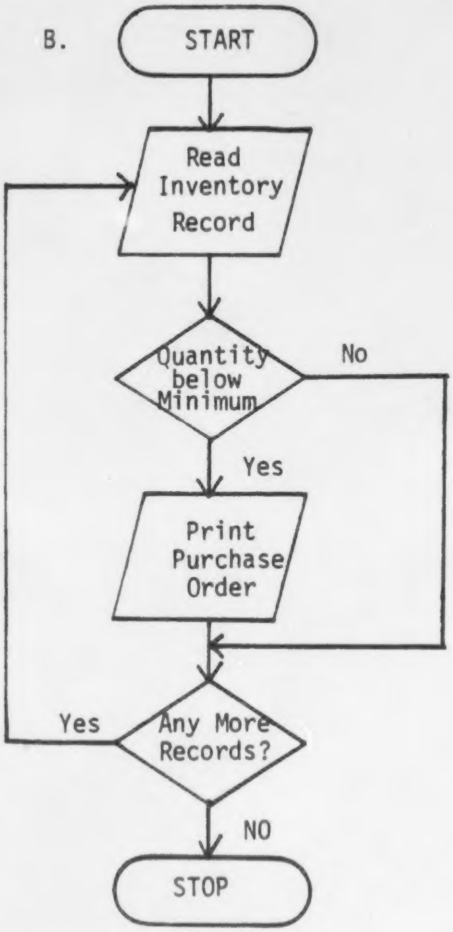
INTRODUCTION TO FLOWCHARTING

ANSWERS TO ASSIGNMENT SHEET #1

Instruction	Type of Activity	Symbol
6. Write column headings	output	
7. Cost = $00.00?	decision	
8. Yardage = depth X width	process	
9. Read name, depth, width, cost	input	
10. Write name, yardage, price	output	
11. Sum = K + 1	process	
12. Read a value	input	

Instruction	Type of Activity	Symbol
13. Value greater than 0?	decision	
14. Let B = 3.74	process	
15. Stop	terminal	

B.


START
Read Inventory Record
Quantity below Minimum
No
Yes
Print Purchase Order
Yes
Any More Records?
NO
STOP

INTRODUCTION TO FLOWCHARTING

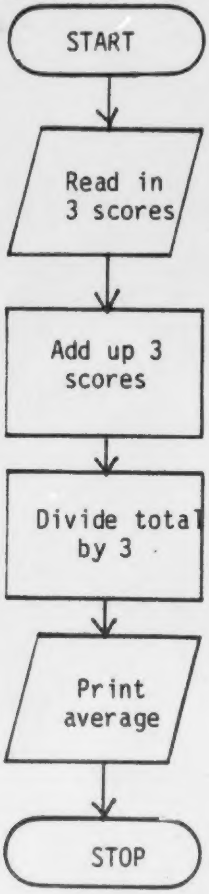
ANSWERS TO ASSIGNMENT SHEETS

ASSIGNMENT SHEET #2

Read in 3 scores.
Get total of 3 scores.
Divide total by 3.
Print answer.

ASSIGNMENT SHEET #3

(Answers may vary, and any reasonable answers should be counted as correct.)


START
Read in 3 scores
Add up 3 scores
Divide total by 3
Print average
STOP

ASSIGNMENT SHEET #4

(1) The column headings will be printed every time a card is read. Should be printed only once.

(2) The price cannot be computed before yardage is computed. The two steps are reversed.

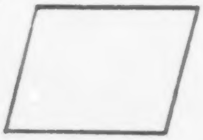
INTRODUCTION TO FLOWCHARTING

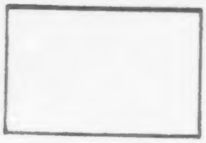
TEST

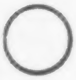
1. MULTIPLE CHOICE: Circle the number of the correct answer.

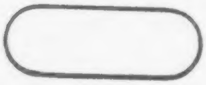
   What is the appropriate symbol for the instruction given?

   a. Start

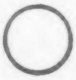
   1. 

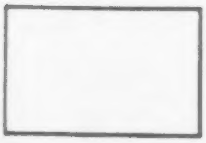
   2. 

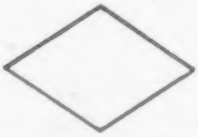
   3. 

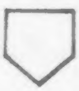
   4. 

   b. Let sales tax = price X .06

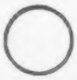
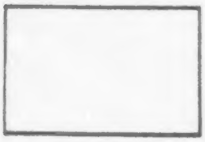
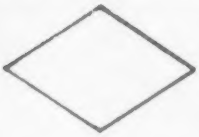
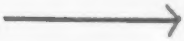
   1. 

   2. 

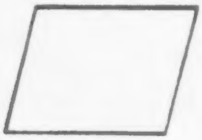
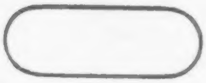
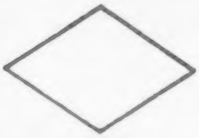
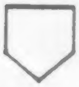
   3. 

   4. 

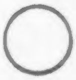
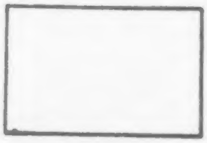
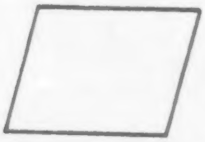
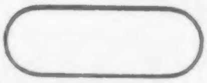
c. Any more data left?

1. 
2. 
3. 
4. 

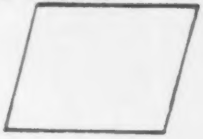
d. Read in sales price

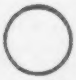
1. 
2. 
3. 
4. 

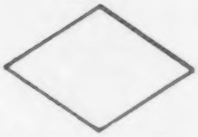
e. Stop

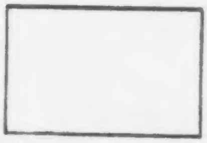
1. 
2. 
3. 
4. 

f. Print a result

1. 

2. 

3. 

4. 

2. TRUE OR FALSE. Using "T" or "F", indicate if the following statements are true or false.

_____a. Looping refers to the choice of an alternative action based on a condition.

_____b. Sequence refers to the process of visually checking each step of a flowchart for the purpose of eliminating errors.

_____c. Initialization is the beginning of a set of functions in a flowchart.

_____d. A flowchart does not depend on the language which the programmer will eventually use to code instructions.

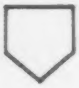
_____e. A sequence of instructions which is repeated is called a loop.

_____f. A decision is the end of a set of instructions in a flowchart.

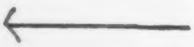
_____g. Termination in a flowchart has to do with steps following one after the other.

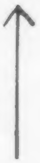
3. MATCHING: Match the functions on the right to the appropriate symbol on the left.

_____a.

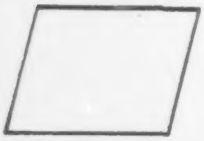


_____b.

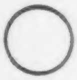




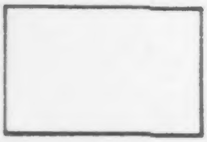
___ c.



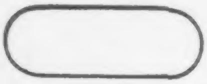
_____d.



_____f.



_____g.



1. Decision
2. Flow line
3. Input/output
4. Off-page connector
5. On-page connector
6. Process
7. Terminal activity

INTRODUCTION TO FLOWCHARTING

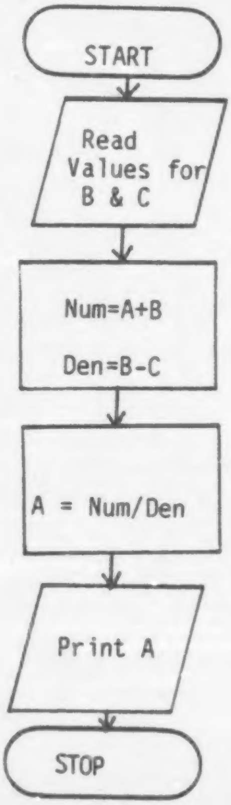
ANSWERS TO PRETEST

1. a. 6
   b. 5
   c. 7
   d. 4
   e. 3
   f. 1
   g. 2

2. a. Process or computation
   b. input or output
   c. terminal activity, START OR START, initialize or terminate
   d. decision
   e. on-page connector
   f. shows flow of logic
   g. off-page connector

3. Read values for B & C
   Add B & C giving numerator
   Subtract C from B giving denominator
   Compute A by dividing numerator by denominator
   Print A

4.



5. a. invalid--The flowchart should return to the read statement for new input.
   b. invalid--The flowchart will print the average if it is less than or equal to 90 instead of greater than 90 ("Yes" and "No" reversed).

INTRODUCTION TO FLOWCHARTING

ANSWERS TO TEST

1. Multiple Choice.

   a. 4
   b. 2
   c. 3
   d. 1
   e. 4
   f. 1

2. True or False.

   a. F
   b. F
   c. T
   d. T
   e. T
   f. F
   g. F

3. Matching.

   a. 4
   b. 2
   c. 3
   d. 5
   e. 1
   f. 6
   g. 7

INTRODUCTION TO PROGRAMMING LANGUAGES

UNIT OBJECTIVE

After completion of this unit, the student should be familiar with characteristics of some common programming languages and should develop a familiarity with common terms and procedures used for programming in any language. The learner should be able to code a simple program in a language selected by the instructor. This knowledge will be evidenced by completion of assignments, demonstration, and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to coding in a programming language to their correct definitions.
2. Match some common programming languages to their characteristics.
3. Develop logic and flowchart(s) necessary for coding.
4. Code a computer program in a language selected by the instructor.
5. Develop and follow a test plan for a program.
6. Demonstrate the ability to key and submit a program for processing.

PREREQUISITES

Basic Data Processing Concepts and Functions

Historical Development of Data Processing (optional)

Common Features of Data Processing Systems

Data Processing Applications and Careers (optional)

Introduction to Problem Analysis

Introduction to Flowcharting

INTRODUCTION TO PROGRAMMING LANGUAGES

SUGGESTED ACTIVITIES

NOTE to Instructor: Because of the wide range of programming courses and computer systems available in different institutions, this unit is intended to be used as an introduction to any programming language. The material will, of course, need to be supplemented with textbook material on the language which is taught in your course. The unit can be adapted to whatever time period is appropriate for the skill level of the students.

1. Instructor:

   A. Give pretest.

   B. Provide student with objective, information, and assignment and job sheets.

   C. Make transparencies.

   D. Discuss unit and specific objectives.

   E. Discuss information, assignment sheets, and job sheet.

   F. Use TM 1 to explain the functions of the source program, compiler program, and object program.

   G. Use TM 2 to introduce and discuss programming languages.

   H. Introduce fundamental rules necessary for writing a simple program in the language of your choosing.

   I. Discuss with students the General Guidelines for Coding in a Programming Language (Information Sheet). Students will be following these steps in writing their programs.

   J. Provide individual help on assignment and job sheets as necessary.

   K. Give test.

II. Student:

   A. Take pretest.

   B. Read objective sheet.

   C. Study information sheet.

   D. Take notes on your instructor's presentations on coding in a programming language. Complete any assignment which your instructor gives you.

E. Using the information sheet, transparencies, and class notes, complete all assignment and job sheets.

F. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

A. Objective sheet.

B. Information sheets.

C. Transparency masters: TM 1 - Four Steps in Program Translation

TM 2 - Programming Language Comparison

D. Assignment sheets: #1 - Develop the Logic Sequence for a Program.

#2 - Code a Computer Program.

#3 - Debug a Program.

#4 - Develop and Follow a Test Plan.

E. Job sheet: #1 - Key and Submit a Program for Processing.

F. Answers to assignment sheets.

G. Pretest and test.

H. Answers to pretest and test.

II. References

A. Cougar and McFadden. A First Course in Data Processing. John Wiley & Sons, Inc., 1977.

B. Cougar & Shannon. FORTRAN IV: A.P.I. Approach Including Structured Programming. Richard D. Irwin, Inc., 1976.

C. Dock and Essick. Principles of Business Data Processing. SRA, Inc., 1978.

D. Silver and Silver. Introduction to Programming: Programming Logic and Flowcharting. McGraw-Hill Book Company, 1977.

E. Sippl and Sippl. Computer Dictionary and Handbook. Howard W. Sams & Co., Inc., 1972.

F. Wu, Wm. C. Business Programming in FORTRAN IV. Brown Company Publishers, 1977.

G. References available in your school.

INTRODUCTION TO PROGRAMMING LANGUAGES

PRETEST

1. Match the terms on the right to the correct definitions.

_____a. The name assigned to a variable in a programming language according to the specifications of that language.

_____b. A schematic or graphic presentation of the logic required to solve a problem.

_____c. A sequence of instructions written in a computer programming language.

_____d. A sequence of machine-executable instructions derived from source program statements.

_____e. The translator program for a language such as FORTRAN or COBOL; translates source-program statements into machine-executable code.

_____f. The process in which a computer translates the commands in a symbolic program into their machine language equivalent.

_____g. A subsystem of the operating system which is capable of performing specialized, repeatedly used, functions.

_____h. An ordered set of instructions intended for general or frequent use.

_____i. A program section, essentially complete within itself, which is accessed by the main program or another subprogram during execution.

_____j. The process of performing the instructions of the object program.

_____k. Words which have a particular meaning to the computer and can be used for no other purpose.

_____l. The process of detecting, locating, isolating, and eliminating errors in a program.

_____m. A class of programming languages which are generally machine-independent.

1. Compilation
2. Compiler
3. Computer program
4. Data name
5. Debugging
6. Desk-check
7. Execution
8. Flowchart
9. High-level programming languages
10. Initialization
11. Looping
12. Machine
13. Object program
14. Operand
15. Operation
16. Reserved words
17. Routine
18. Source program
19. Subroutine
20. Syntax

_____n. A programming language which is machine-dependent; characterized by the numeric representation of instructions.

_____o. The grammatical correctness of instruction structure; rules of instruction design.

_____p. Running a program with all possible types of sample input data that simulates conditions likely to be found in the real data that will be processed by the program.

_____q. A set of instructions to a computer to perform a specific task.

_____r. The repetitive execution of a series of instructions.

_____s. A symbol whose numeric value changes from one repetition of the program.

_____t. The first part of an instruction that tells the computer what action to perform, such as add, read, or compare.

_____u. The second part of an instruction that tells the computer where to find data to be processed.

_____v. The establishment of a beginning value of a variable in a program.

_____w. The process of visually checking each line of a program after it has been keyed-in for the purpose of eliminating errors.

21. Testing

22. Utility program

23. Variable

2. Match the computer language on the right to the language descriptions on the left.

_____a. First commercially available language; a procedure-oriented language with sophisticated mathematic abilities. Widely used for scientific applications. Not well suited for programs involving file maintenance, editing of data, or production of documents.

_____b. Most frequently used business language; the language reads like English in sentence-like statements. Tends to be wordy. Computational abilities are limited; seldom used for mathematical or scientific applications.

_____c. Developed for time-sharing use by people with little or no programming experience. Can be used for both business and scientific applications and with small or large computing systems.

_____d. A problem-oriented language originally designed to produce business reports. Used primarily with small computer systems. An easy language to learn; however, computational abilities are limited.

_____e. A procedure-oriented language usable for both scientific and business applications. Easy for beginners to use; however, the large amount of storage required by its compiler limits its use to large computers.

_____f. An interactive language requiring a special keyboard for entering statements. Requires a fairly large computing system. A powerful language which can perform complex operations with a minimum of coding.

_____g. A machine-dependent language which uses symbolic names (English-like abbreviations) to specify machine operations. Requires a high level of skill to use effectively.

1. Assembler
2. APL
3. BASIC
4. COBOL
5. FORTRAN
6. PL/1
7. RPG

3. Write a program which will read-in the distance between two cities and the average speed of a tour bus, and then compute the time required to travel between the two cities. Use the following formula:

$$\text{Time} = \text{Distance} \div \text{Speed}$$

Your printout should list the values for distance, speed, and time.

Input is in the following format:

Columns 1 - 3 Distance

4 - 5 Speed

4. Develop a testing plan for the program in #3. List sample values for distance and speed and show what your output should look like.

INTRODUCTION TO PROGRAMMING LANGUAGES

INFORMATION SHEET

I. Terms and definitions (TM 1)

   A. Compilation--The process by which a computer translates the commands in a symbolic program into their machine language equivalent.

   B. Compiler--The translator program for a language such as FORTRAN or COBOL; translates source-program statements into machine-executable code.

   C. Computer program--A set of instructions to a computer to perform a specific task.

   D. Data name--The name assigned to a variable in a programming language according to the specifications of that language.

   E. Debugging--The process of detecting, locating, isolating, and eliminating errors or "bugs" in a program.

   F. Desk-check--The process of visually checking each line of a program after it has been keyed-in for the purpose of eliminating errors.

   G. Execution--The process of performing the instructions of the object program.

   H. Flowchart--A schematic or graphic presentation of the logic required to solve a problem.

   I. High-level programming languages--A class of programming languages which are generally machine-independent.

   J. Initialization--The establishment of a beginning value of a variable in a program.

   K. Looping--The repetitive execution of a series of instructions.

   L. Machine language--A programming language which is machine-dependent, characterized by the numerical representation of instructions.

   M. Object program--A sequence of machine-executable instructions derived from source program statements.

   N. Operand--The second part of an instruction that tells the computer where to find data to be processed.

   O. Operation--The first part of an instruction that tells the computer what action to perform, such as add, read, or compare.

   P. Reserved words--Words which have a particular meaning to the computer and can be used for no other purpose.

Q. Routine--An ordered set of instructions intended for frequent or general use.

R. Source program--A sequence of instructions written in a computer programming language.

S. Subroutine--A program section, essentially complete within itself, which is accessed by the main program or another subprogram during execution.

T. Syntax--The grammatical correctness of instruction structure; rules of instruction design.

U. Testing--Running a program with all possible types of sample input data that simulate conditions likely to be found in the real data that will be processed by the program.

V. Utility program--A subsystem of the operating system which is capable of performing specialized, repeatedly used functions, such as sorting, merging, and transferring data from one I/O device to another.

W. Variable--A storage location whose value may change from one repetition of a program to the next or changes within a repetition of the program.

II. Common programming languages: (TM 2)

A. Assembler--A machine dependent language which uses symbolic names (English-like abbreviations) to specify machine operations. Requires a high level of skill to use effectively.

B. FORTRAN (FORmula TRANslator)--First commercially available language; a procedure-oriented language with sophisticated mathematic abilities. Widely used for scientific applications. Not well suited for programs involving file maintenance, editing of data, or production of documents.

C. COBOL (COmmon Business Oriented Language)--Most frequently used business language; the language reads like English in sentence-like statements. Tends to be wordy. Computational abilities are limited; seldom used for mathematical or scientific applications.

D. PL/I (Programming Language One)--A procedure-oriented language usable for both scientific and business applications. Easy for beginners to use; however, the large amount of storage required by its compiler limits its use to large computers.

E. RPG (Report Program Generator)--A problem-oriented language originally designed to produce business reports. Used primarily with small computer systems. An easy language to learn; however, computational abilities are limited.

F. BASIC (Beginners' All-Purpose Symbolic Instruction Code)--developed for time-sharing use by people with little or no programming experiience. Can be used for both business and scientific applications and with small or large computing systems.

G. APL (A Programming Language)--An interactive language requiring a special keyboard for entering statements. Requires a fairly large computing system. A powerful language which can perform complex operations with a minimum of coding.

III. General guidelines for coding in a programming language.

A. Preliminary activities--Analyze the problem, including flowcharting and selecting the appropriate language.

B. Select appropriate data names according to the rules of the programming language.

C. Initialize values of variables if necessary.

D. Code the logic sequence.

E. Terminate execution of the program, according to the rules of the programming language.

F. Debug--Debugging is the process of detecting, locating, isolating, and eliminating errors, or "bugs", in a program. There are basically three types of errors:

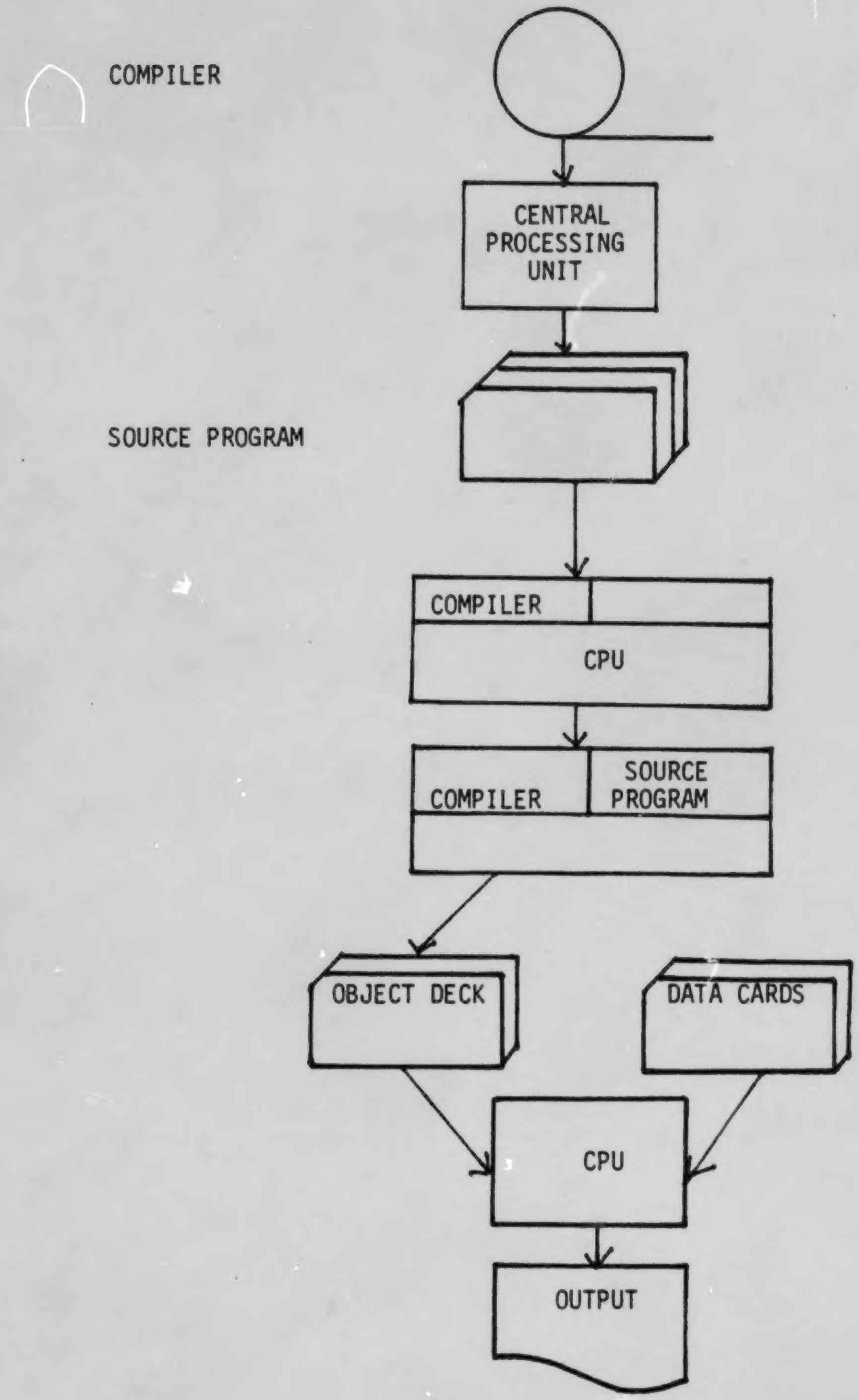
1. Compile time errors--these are errors which the compiler program will detect and flag. Syntax errors are usually detected during compilation.

2. Run time, or execution, errors--these errors are not detected by the compiler, but cause failure of the program during execution (examples: wrong data types, attempting to divide by zero, infinite loops).

3. Logic errors--these errors may not be detected during compilation or execution. Basically, if a section of code doesn't accomplish what it is supposed to do, it is invalid even though there may be no errors flagged.

G. Develop and follow through with testing plan.

PROGRAM TRANSLATION


COMPILER
CENTRAL PROCESSING UNIT
SOURCE PROGRAM
COMPILER
CPU
COMPILER
SOURCE PROGRAM
OBJECT DECK
DATA CARDS
CPU
OUTPUT

A. LOAD COMPILER PROGRAM INTO CPU.

B. READ SOURCE PROGRAM INTO CPU.

C. TRANSLATE SOURCE PROGRAM, PRODUCING OBJECT DECK.

D. LOAD OBJECT DECK AND DATA CARDS. BEGIN EXECUTION.

PROGRAMMING LANGUAGE COMPARISON

	ASSEMBLER LANGUAGE	FORTRAN	COBOL	PL/1	RPG	BASIC	APL
STRONG MATH CAPABILITIES	X	X		X		X	X
GOOD CHARACTER MANIPULATION	X		X	X		X	X
ENGLISH-LIKE			X	X			
AVAILABLE ON MANY COMPUTERS	X	X	X		X	X	
HIGHLY EFFICIENT	X						
STANDARDIZED		X	X	X		X	
REQUIRES LARGE AMOUNTS OF STORAGE			X	X			X
GOOD INTERACTIVE CAPABILITIES						X	X
PROCEDURE-ORIENTED		X	X	X			
PROBLEM-ORIENTED						X	
MACHINE-DEPENDENT						X	

SOURCE: COMPUTERS AND DATA PROCESSING, STEVEN L. MANDELL, WEST PUBLISHING COMPANY, 1979, P. 279.

INTRODUCTION TO PROGRAMMING LANGUAGES

ASSIGNMENT SHEET #1--DEVELOP THE LOGIC SEQUENCE FOR A PROGRAM

Assume that the following numbers are test scores for your class. Your job is to compute and print the average of the 30 test scores, using the programming language selected by your instructor.

90	75	95	80	99
85	83	84	89	76
92	90	49	79	83
76	93	100	73	91
65	82	78	97	88
53	83	81	67	77

Develop the algorithm to solve the problem and construct the flowchart on this page.

INTRODUCTION TO PROGRAMMING LANGUAGES

ASSIGNMENT SHEET #2--CODE A COMPUTER PROGRAM

Code your computer program using the flowchart developed in Assignment Sheet #1 as a guide. Use the programming language introduced to you by your instructor. Review the General Guidelines for Coding in a programming language before beginning this assignment.

A. List the variables (spelled out):

B. Select appropriate data names for the variables listed under A.

C. Code the computer program, initializing values where necessary, coding the logic sequence, and terminating the program.

D. DESK-CHECK the program.

E. Complete Job Sheet #1 before going on to Assignment Sheet #3.

INTRODUCTION TO PROGRAMMING LANGUAGES

JOB SHEET #1--KEY AND SUBMIT A PROGRAM FOR PROCESSING

Using the media available in your school (punch card, CRT terminal, etc.), key the program you coded in Assignment Sheet #2 and submit the program for processing. Your instructor will give a demonstration before you complete this assignment.

INTRODUCTION TO PROGRAMMING LANGUAGES

ASSIGNMENT SHEET #3--DEBUG A PROGRAM

NOTE: Complete Job Sheet #1 before proceeding to this assignment.

Using compiler messages as a guideline, correct any syntax errors in your program. Then resubmit your program until it is error-free.

INTRODUCTION TO PROGRAMMING LANGUAGES

ASSIGNMENT SHEET #4--DEVELOP AND FOLLOW A TEST PLAN

Testing is the last step in coding a computer program. A program can be free of all syntax errors and run with no compiler error messages and still be incorrect. That is, if the program runs with no syntax errors but still gives incorrect output because of logic errors, it is worthless. Unfortunately, the computer cannot think, but can only follow the instructions provided for it.

Testing involves running a program with all possible types of sample input data (with known answers) that simulate conditions likely to be found in the real data that will be processed by the program. Sample input data may include the smallest and largest data values expected in the real data, as well as values in between. If negative values are possible, some negative values should be used in the sample data. Perhaps a data value could be zero; if so, that value should also be included.

Devise sample input data for your test average program. List the input data here:

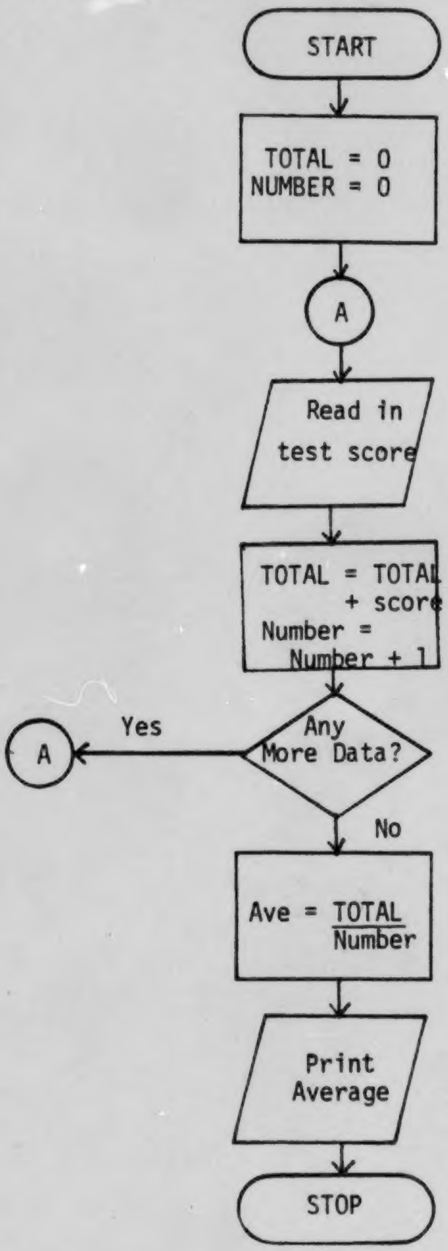
What is your expected answer?______________________________

Run the program using the sample data and check the accuracy of your results. Correct any logic errors that you find and rerun the program until your output is valid. Then run the program with the real data. Submit the output from both runs to your instructor for evaluation.

INTRODUCTION TO PROGRAMMING LANGUAGES

ANSWERS TO ASSIGNMENT SHEET #1

This flowchart is one solution to the problem. Other solutions may also be correct and should be graded individually.


START
TOTAL = 0
NUMBER = 0
A
Read in test score
TOTAL = TOTAL + score
Number = Number + 1
Any More Data?
Yes
A
No
Ave = TOTAL / Number
Print Average
STOP

INTRODUCTION TO PROGRAMMING LANGUAGES

ANSWERS TO ASSIGNMENT SHEETS

ASSIGNMENT SHEET #2

Since different institutions will be using different programming languages, no solution is given here. The student is given guidelines for an approach for coding the program, and these steps should be followed.

ASSIGNMENT SHEET #3

Individual help should be provided for students in debugging their programs. For those students who finish debugging early, additional debugging activities can be provided by asking them to assist other students.

ASSIGNMENT SHEET #4

Test plans devised by the student will need to be evaluated individually.

INTRODUCTION TO PROGRAMMING LANGUAGES

TEST

1. MULTIPLE CHOICE: Circle the number of the correct answer.

   a. The translator program for a language such as FORTRAN or COBOL, which translates the program into machine executable code, is called the

      1. source program.
      2. object program.
      3. computer program.
      4. compiler program.

   b. The sequence of machine executable instructions is called the

      1. source program.
      2. object program.
      3. computer program.
      4. compiler program.

   c. A schematic or graphic presentation of the logic required to solve a problem is called a/an

      1. machine language.
      2. flowchart.
      3. object program.
      4. utility program.

   d. A ? is a program section, essentially complete within itself, which is accessed by the main program or another subprogram during execution.

      1. subroutine
      2. source program
      3. reserved word
      4. compiler

   e. A ? is a subsystem of the operating system which is capable of performing specialized, repeatedly used functions such as sorting or merging.

      1. compiler program
      2. computer program
      3. source program
      4. utility program

   f. A class of programming languages which are generally machine-independent are

      1. machine languages.
      2. high-level languages.
      3. low-level languages.
      4. assembly languages.

g. ___?___ refers to detecting, locating, and eliminating errors in a program.

1. Looping
2. Initializing
3. Debugging
4. Executing

h. ___?___ words have a special meaning to the computer and can be used for no other purpose.

1. Routine
2. Special
3. Machine
4. Reserved

i. The process of performing the instructions of an object program is called

1. execution.
2. translation.
3. compilation.
4. inspection.

j. In order to be able to refer to a variable in a program, each variable is assigned a/an

1. operand.
2. data name.
3. operation.
4. reserved word.

k. ___?___ are machine dependent and are characterized by the numeric representation of instructions.

1. High level languages
2. Low level languages
3. Assembly languages
4. Machine languages

l. Errors in the structure of an instruction are called ___?___ errors.

1. logic
2. syntax
3. run-time
4. execution

m. ___?___ has to do with running a program with all possible types of input data.

1. Desk-checking
2. Debugging
3. Testing
4. Compiling

n. Repetitive execution of a series of instructions is called

1. looping.
2. desk-checking.
3. compiling.
4. debugging.

o. A ? is the second part of an instruction which tells the computer to find data to be processed is the

1. variable
2. operand
3. data name
4. operation

p. A ? is a storage location whose value may change from one repetition of a program to the next or within a repetition of a program.

1. data name
2. loop
3. variable
4. routine

2. TRUE OR FALSE: Using "T" or "F", indicate if the following statements are true or false.

_____a. RPG is a problem-oriented language originally designed to produce business reports. Computational abilities in this language are limited.

_____b. Assembler programs can easily be used by different machines.

_____c. APL is an interactive language which requires a special keyboard.

_____d. A high degree of skill is required for programming in BASIC.

_____e. FORTRAN is one of the more recent languages available, but its limited computational abilities make it impractical for scientific applications.

_____f. COBOL is the most frequently used business language. It tends to be wordy, but its statements are easily understood.

_____g. PL/I is an easy-to-use language which can be used on mini-and micro-computers.

INTRODUCTION TO PROGRAMMING LANGUAGES

ANSWERS TO PRETEST

1. a. 4
b. 8
c. 18
d. 13
e. 2
f. 1
g. 22
h. 17
i. 19
j. 7
k. 16
l. 5
m. 9
n. 12
o. 20
p. 21
q. 3
r. 11
s. 23
t. 15
u. 14
v. 10
w. 6

2. a. 5
b. 4
c. 3
d. 7
e. 6
f. 2
g. 1

3. Solution will depend on the language used in your course.

4. Solutions will need to be graded individually.

INTRODUCTION TO PROGRAMMING LANGUAGES

ANSWERS TO TEST

1. Multiple Choice.

   a. 4
   b. 2
   c. 2
   d. 1
   e. 4
   f. 2
   g. 3
   h. 4
   i. 1
   j. 2
   k. 4
   l. 2
   m. 3
   n. 1
   o. 2
   p. 3

2. True or False.

   a. T
   b. F
   c. T
   d. F
   e. F
   f. T
   g. F

INTRODUCTION TO DOCUMENTATION

UNIT OBJECTIVE

After completion of this unit, the student should be able to document programs which he/she has developed. This knowledge will be evidenced by completion of assignments and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the learner should be able to:

1. Match related terms to the correct definitions.
2. List benefits of proper program documentation.
3. Describe three types of documentation.
4. Write a documentation narrative explaining the overall purpose of a program input and output, and formulas and calculations required in the program.

PREREQUISITES

Basic Data Processing Concepts and Functions

Historical Development of Data Processing (optional)

Common Features of Data Processing Systems

Data Processing Applications and Careers (optional)

Introduction to Problem Analysis

Introduction to Flowcharting

Introduction to Programming Languages

INTRODUCTION TO DOCUMENTATION

SUGGESTED ACTIVITIES

I. Instructor:

  A. Give pretest.

  B. Provide student with objective sheet.

  C. Provide student with information and assignment sheets.

  D. Discuss unit and specific objectives.

  E. Discuss information and assignment sheets.

  F. Provide data for payroll problem (Assignment Sheet #3).

  G. Give test (Supply program for Question #4).

II. Student:

  A. Take pretest.

  B. Read objective sheet.

  C. Study information sheet.

  D. Complete assignment sheets.

  E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet.

  B. Information sheets.

  C. Assignment sheets: #1 - Write a Documentation Narrative
  #2 - Flowchart
  #3 - In-Program Documentation

  D. Answers to assignment sheets.

  E. Pretest and test.

  F. Answers to pretest and test.

II. References:

A. Conger, Daniel J. and Fred R. McFadden. A First Course in Data Processing. Santa Barbara, CA: John Wiley & Sons, Inc., 1977.

B. Sippl, Charles J. and Charles P. Sippl. Computer Dictionary and Handbook. Indianapolis, Indiana: Howard W. Sams & Co., Inc., 1966.

C. Dock, Thomas V. and Edward Essick. Principles of Business Data Processing. Chicago: Science Research Associates, Inc., 1978.

D. References available in your school.

INTRODUCTION TO DOCUMENTATION

PRETEST

1. Match the terms on the right to the correct definition.

_____a. A language that serves as a link between the operating system and the application programs. To define jobs being processed, programs to be executed, and provide for job-to-job transition.

_____b. The process of gathering, organizing, storing, and indexing information into an orderly presentation.

_____c. A graphic aid to problem solving, which lists conditions to check and the actions to be taken when these conditions are found.

_____d. A generalized program within the operating system that performs necessary, but routine jobs.

_____e. A graphic presentation of the logic required to solve a problem.

_____f. An explicit set of instructions that direct the computer and coordinate the operations of the various hardware components.

_____g. Organized groups of input or output records.

_____h. The process of describing, in detail, every phase of the programming cycle and specific facts about the program being produced.

_____i. A set of documentation materials which explains the function and operation of a program/program package.

_____j. Individual statements used to direct an operating system in its functions.

_____k. A rule or principle expressed in algebraic symbols.

_____l. The process of logically organizing information which will be generated in producing a computer program into a useful file that continually reflects the current state of the program.

1. Decision table
2. Documentation
3. Flowchart
4. Formula
5. I/O files
6. Job control language (JCL)
7. Job control statement
8. Program documentation
9. Program package
10. Subroutine
11. User's manual
12. Utility program

2. List three benefits of proper program documentation.

   a.

   b.

   c.

3. List and describe three types of documentation.

   a.

   b.

   c.

4. Using a program supplied by your instructor, write a documentation narrative to explain:

   a. The overall purpose of the program.

   b. Input and output.

   c. Formulas and calculations.

INTRODUCTION TO DOCUMENTATION

INFORMATION SHEET

I. Terms and definitions

A. Decision table--A graphic aid to problem solving, which lists conditions to be checked and the actions to be taken when these conditions are found.

B. Documentation--The process of gathering, organizing, storing, and indexing information into an orderly presentation.

C. Flowchart--A graphic presentation of the logic required to solve a problem.

D. Formula--A rule or principle expressed in algebraic symbols.

E. I/O files--Organized groups of input or output records.

F. Job control language(JCL)--A language that serves as a link between the operating system and the application programs. To define jobs being processed, programs to be executed, and provide for job-to-job transition.

G. Job control statement--Individual statements used to direct an operating system in its functions.

H. Program documentation--The process of logically organizing information which will be generated in producing a computer program into a useful file that continually reflects the current state of the program; includes written text and flowcharts.

I. Program package--An explicit set of instructions that direct the computer and coordinate the operations of the various hardware components.

J. Subroutine--A group of instructions used a number of times in a program and can be called as needed.

K. User's manual--A set of documentation materials which explain the function and operation of a program/program package.

L. Utility program--A generalized program within the operating system that performs necessary, but routine, jobs.

II. What is documentation?

Review for a moment the phases of the programming cycle which you have already experienced--problem analysis, flowcharting, coding, and testing. The last phase in the programming cycle is documentation, and its importance cannot be over-emphasized. Documentation involves describing, in writing, every phase of the programming cycle and specific facts about the program being produced. The documentation process should occur at all phases of the programming cycle. Actually, you have already done some documentation in previous classwork by defining problems, constructing flowcharts, coding and writing operating instructions. The documentation which you will produce in this module; however, will be more detailed and more formal than what you have done thus far.

III. The documentation process

A. Problem definition phase

During the problem definition phase, the programmer works closely with systems analysts and with users. Oral communication is very important at this phase. Systems analysts, programmers, and users must all understand the problem and the ultimate goal of the program. Ideally, this is the time to write a documentation narrative which explains the overall purpose of the program. The written explanation should describe program input in detail, including data file source and format. It should explain how data will be manipulated within the program. This part of the documentation will explain, in written form, each algebraic formula used in the program. If subroutines or utility programs are used, their functions should also be explained. Finally, documentation narrative should include an explanation of the output of the program. The documentation narrative should be written so that non-data processing personnel can understand it. In this way, programmers, users, and systems analysts can communicate both orally and in written form before program coding begins, and understanding will be enhanced.

B. Flowcharting

Thus far, you have used flowcharting as a tool in analyzing problems. The flowchart of a problem is a graphic, or pictorial, presentation of the logic required to solve that problem. As such, it is considered an important part of the written documentation which should accompany a program. The programmer should become proficient at writing flowcharts which can be understood by non-data processing personnel, or users, and flowcharts which are much more specific to be used only by programmers as a guide in coding programs. The flowcharting phase creates another opportunity for communication between users and programmers. At this point, the user can understand the process which the programmer has depicted in a user-oriented flowchart, and any misunderstandings can be corrected at this time.

C. In-program documentation

All computer languages provide for "remark" or "comment" statements within the program. The only function of these statements is to make the program easier to read and understand. If the programmer refers to a program at a later time, perhaps months or even years later, these comments or remark statements can save time in understanding what a program's function is and also in altering that program if changes are required. For this reason, in-program documentation is as important as the documentation narrative and flowchart which accompany the program.

IV. Importance of documentation

The entire documentation package enables everyone involved with a problem to understand a program, and it greatly enchances communication among systems analysts, programmers, and users. Going through the process of writing a documentation narrative and constructing clear, easy-to-understand flowcharts helps the programmer to be more organized in problem analysis. In addition, proper documentation makes future use of, and modification of, programs much easier.

It should be noted that program documentation must be written in a clear and concise manner. Programmers do not work in a vacuum. They are required to work with, and communicate with, personnel who do not understand the technical language of data processing. Oral communication skills are important, as well as writing skills-vocabulary, punctuation, spelling, and sentence structure all play a part.

INTRODUCTION TO DOCUMENTATION

ASSIGNMENT SHEET #1--WRITE A DOCUMENTATION NARRATIVE

For this assignment, reread the discussion of the problem definition phase of programming on your information sheet. Study the following example of a documentation narrative.

Problem description: Average a group of scores for a six-week grading period.

Input format (on punch cards):

Card column	1-15	Name
	17-19	Quiz 1
	21-23	Quiz 2
	25-27	Test 1
	29-31	Quiz 3
	33-35	Quiz 4
	37-39	Test 2

Quizzes count 10% each, and tests count 30% each. Output should show the student's name, each score, and the six-week average.

Read the documentation narrative for this program below and locate each of the elements of a documentation narrative discussed in your information sheet.

SIX-WEEK AVERAGE PROGRAM

This program computes the six-week average for a group of test scores. The test scores are recorded on punch cards according to the following format: (NOTE: If the data is located on a magnetic tape or disk or other media, it would be appropriate to give the file name and location of the data file.)

Card column	1-15	Name
	17-19	Quiz 1 score
	21-23	Quiz 2 score
	25-27	Test 1 score
	29-31	Quiz 3 score
	33-35	Quiz 4 score
	37-39	Test 2 score

Each of the four quizzes count as 10% of the overall grade, and the two tests are weighted at 30% each. The following formula will be used to calculate the six-week average:

AVERAGE = [(Quiz 1 + Quiz 2 + Quiz 3 + Quiz 4) X .10] + [(Test 1 + Test 2)X.30]

The output will show the student's name, Quiz 1, Quiz 2, Test 1, Quiz 3, Quiz 4, Test 2, and the six-week average, in that order. Column headings will be printed on the output.

Now write a documentation narrative for the following payroll program:

Problem description: The problem is to compute net weekly pay for a group of employees.

Input format (use whatever media is available at your school) is as follows:

Columns	1-25	Name
	27-28	Number of dependents
	30-33	Hourly rate xx.xx (no decimal punched)
	35-36	Hours worked

Any hours over 40 are paid at 1.5 times the regular rate.

Income tax is computed as 18% of weekly wages.

Net pay = Wages - Tax

Output should show the employee's name, the hours worked, and net pay.

Use the following checklist to make sure that your documentation narrative is complete.

Documentation narrative should include:

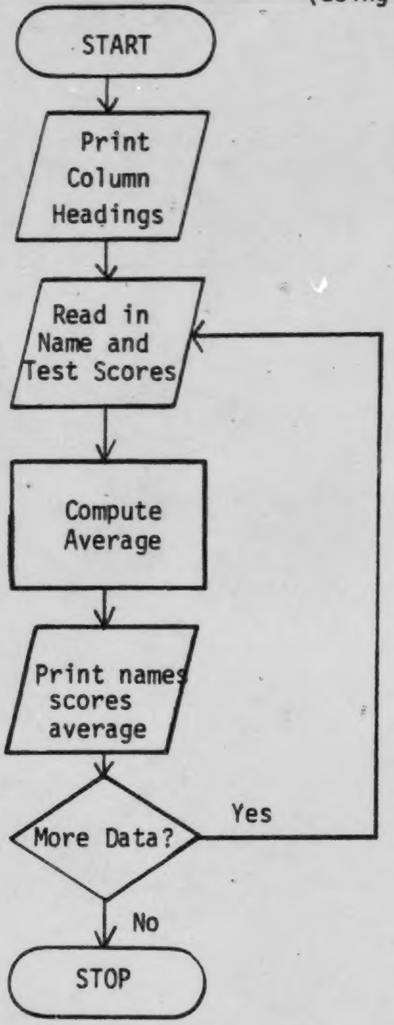
1. Overall description of problem.
2. Detailed description of input.
3. Explanation of any formulas or subroutines used.
4. Explanation of output.

INTRODUCTION TO DOCUMENTATION

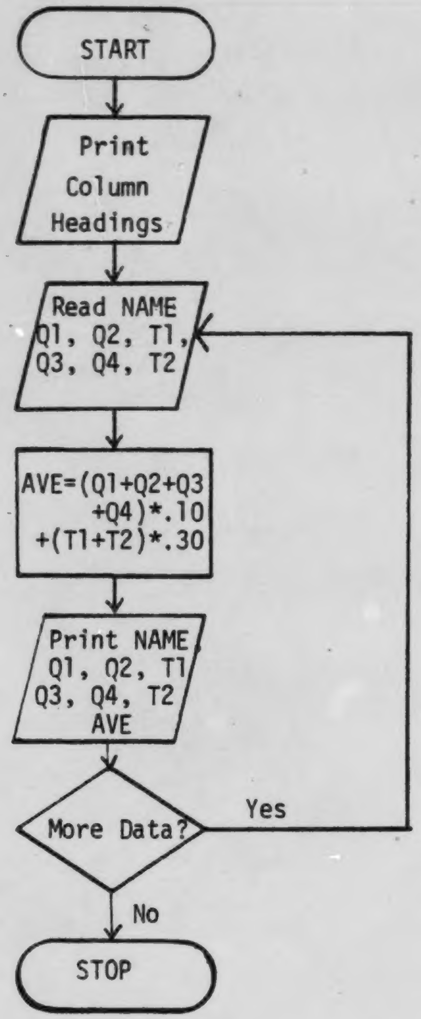
ASSIGNMENT SHEET #2--FLOWCHART

Reread the portion of your information sheet on flowcharting before beginning this assignment. Then study the following example of a user-oriented flowchart and a programmer-oriented flowchart for the six-week average example from Assignment Sheet #1.

User-Oriented flowchart: (using flowlines)


START
Print Column Headings
Read in Name and Test Scores
Compute Average
Print names scores average
More Data?
Yes
No
STOP

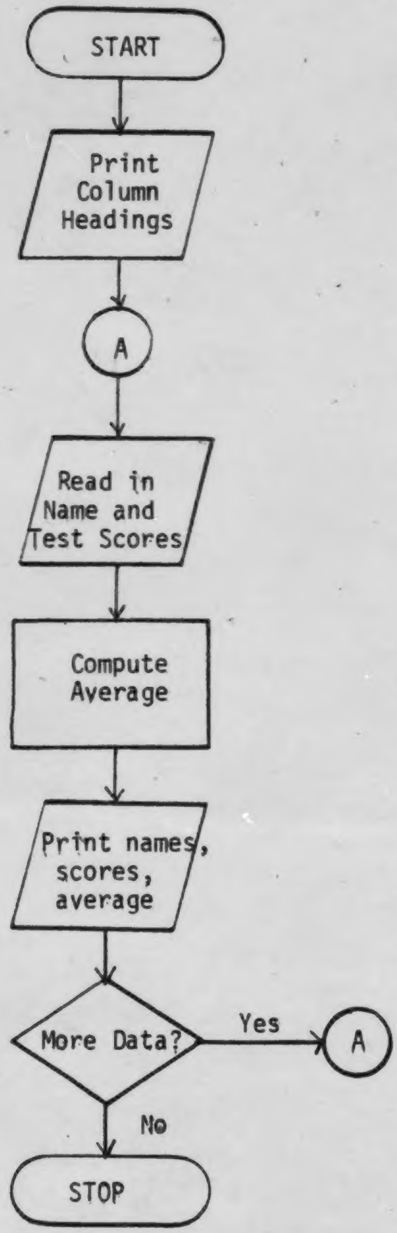
Programmer-Oriented Flowchart:


START
Print Column Headings
Read NAME Q1, Q2, T1, Q3, Q4, T2
AVE=(Q1+Q2+Q3 +Q4)*.10 +(T1+T2)*.30
Print NAME, Q1, Q2, T1 Q3, Q4, T2 AVE
More Data?
Yes
No
STOP

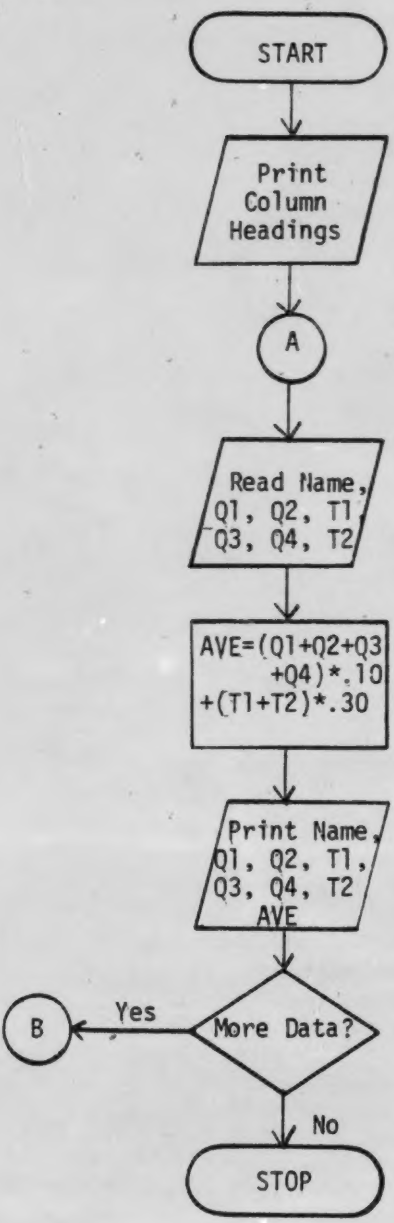
ID 12

User-Oriented flowchart:

(using connectors)


START
Print Column Headings
A
Read in Name and Test Scores
Compute Average
Print names, scores, average
More Data?
Yes
A
No
STOP

Programmer-Oriented flowchart:


START
Print Column Headings
A
Read Name, Q1, Q2, T1, Q3, Q4, T2
AVE=(Q1+Q2+Q3 +Q4)*.10 +(T1+T2)*.30
Print Name, Q1, Q2, T1, Q3, Q4, T2 AVE
More Data?
Yes
B
No
STOP

Now construct a user-oriented flowchart and a programmer-oriented flowchart below for the payroll program in Assignment Sheet #1 using connectors or flowlines.

Payroll Problem, User-Oriented Flowchart:	Payroll Problem, Programmer-Oriented Flowchart:

INTRODUCTION TO DOCUMENTATION

ASSIGNMENT SHEET #3--IN-PROGRAMMING DOCUMENTATION

Using your flowchart as a guide and using the language selected by your instructor, code the payroll program.

As you code your program, insert "comment" or "remark" statements throughout your program to make it easier to read and understand. For example, in the six-week average example of this unit, the first statement could be a comment or remark statement telling what the program does, such as: THIS PROGRAM COMPUTES A SIX-WEEK AVERAGE BASED ON 4 QUIZZES AND 2 TESTS. The statement containing the formula for computing the average might be preceded by a comment or remark statement such as: THE FOLLOWING FORMULA COMPUTES THE AVERAGE, COUNTING QUIZZES AT 10% EACH AND TESTS AT 30% EACH. When you finish your program, show it to someone who does not know anything about programming. If you have documented it properly, anyone should be able to look at it and tell, generally, what the program's purpose is, even though they won't be able to understand the details of the coding.

Debug and test your program. Then turn in to your instructor your documentation narrative, two flowcharts, test run with sample data, and final run using the real data supplied by your instructor.

INTRODUCTION TO DOCUMENTATION

ANSWERS TO ASSIGNMENT SHEET #1

The student's narrative should be checked to make sure that it includes:

1. Overall description of the problem.
2. Detailed description of input.
3. Written explanation of input.

    For hours of 40 or less: Gross Pay = Hours X Rate

    For hours over 40: Gross Pay = (40 X Rate) = [(Hours-40) X 1.5 X Rate]
    Tax = Gross Pay X .18

    Net Pay = Gross Pay - Tax

    (Other approaches may also be correct and should be evaluated individually).

4. Explanation of output.

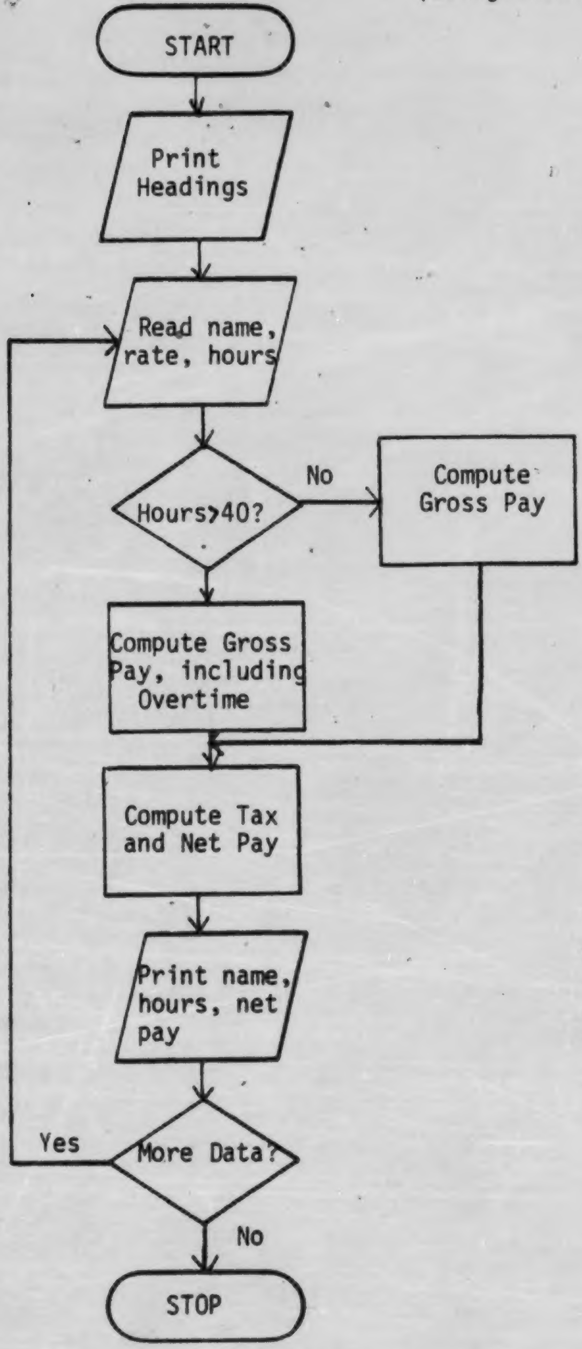
The student's communication skill, including vocabulary, punctuation, spelling, and sentence structure should also be evaluated.

INTRODUCTION TO DOCUMENTATION

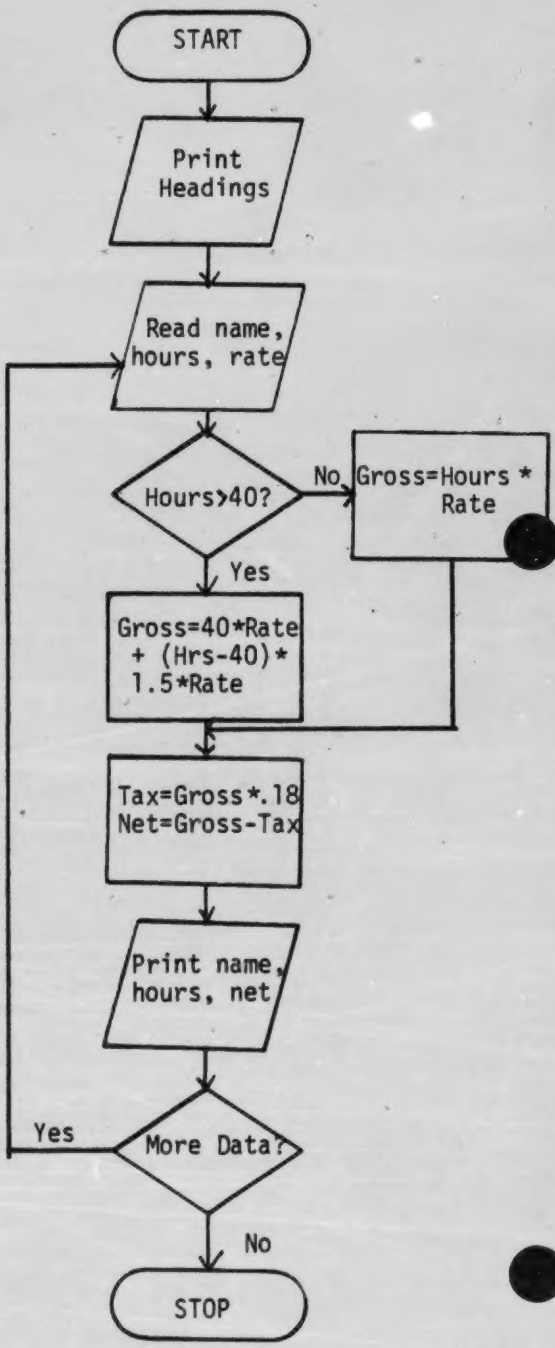
ANSWERS TO ASSIGNMENT SHEET #2

(using flowlines)

User-Oriented Flowchart:


START
Print Headings
Read name, rate, hours
Hours>40?
No
Compute Gross Pay
Compute Gross Pay, including Overtime
Compute Tax and Net Pay
Print name, hours, net pay
Yes
More Data?
No
STOP

Programmer-Oriented Flowchart:

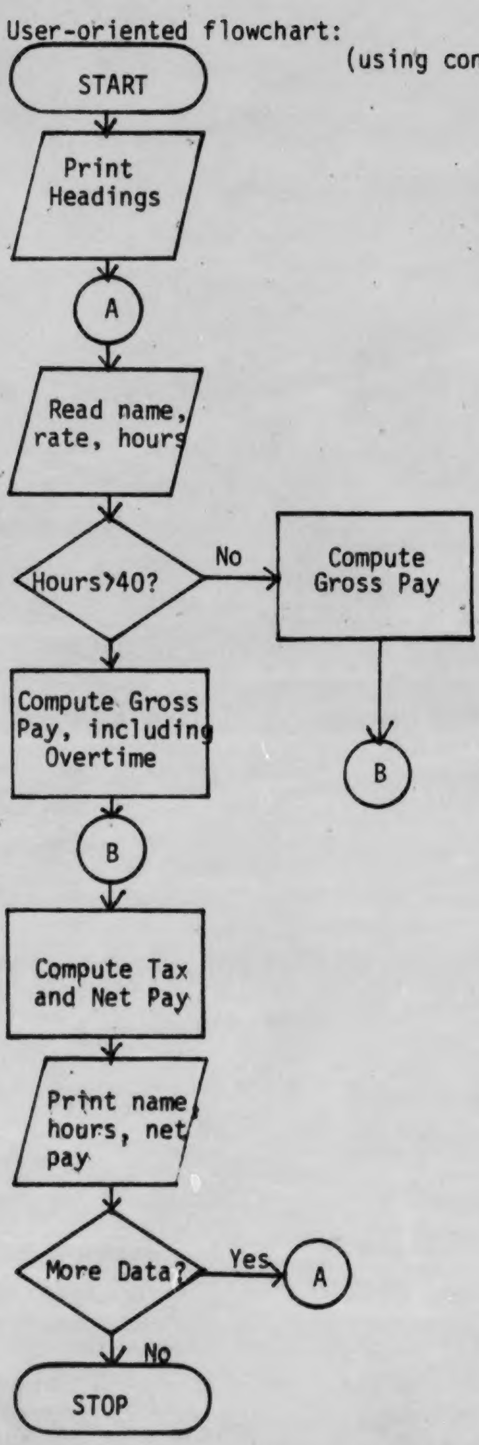

START
Print Headings
Read name, hours, rate
Hours>40?
No
Gross=Hours * Rate
Yes
Gross=40*Rate + (Hrs-40)* 1.5*Rate
Tax=Gross*.18 Net=Gross-Tax
Print name, hours, net
Yes
More Data?
No
STOP

INTRODUCTION TO DOCUMENTATION

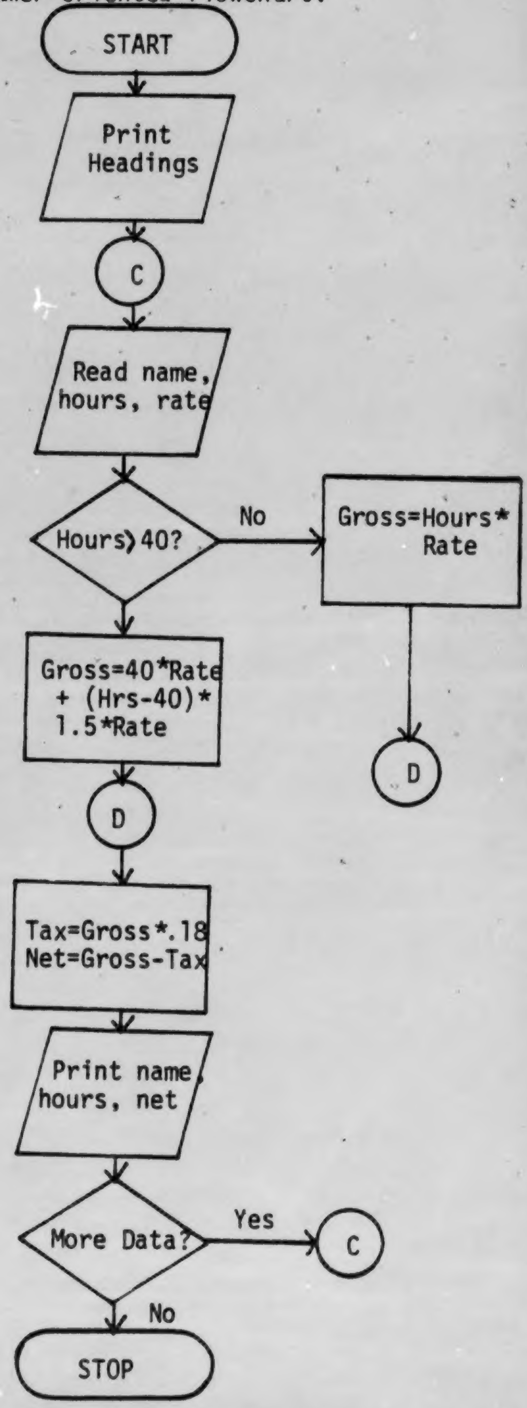
ANSWERS TO ASSIGNMENT SHEET #2

User-oriented flowchart:

(using connectors)


START
Print Headings
A
Read name, rate, hours
Hours>40?
No
Compute Gross Pay
B
Compute Gross Pay, including Overtime
B
Compute Tax and Net Pay
Print name, hours, net pay
More Data?
Yes
A
No
STOP

Programmer-oriented flowchart:


START
Print Headings
C
Read name, hours, rate
Hours>40?
No
Gross=Hours* Rate
D
Gross=40*Rate + (Hrs-40)* 1.5*Rate
D
Tax=Gross*.18
Net=Gross-Tax
Print name, hours, net
More Data?
Yes
C
No
STOP

INTRODUCTION TO DOCUMENTATION

ANSWERS TO ASSIGNMENT SHEET #3

Because of the wide range of languages used at different institutions, programs should be evaluated individually.

INTRODUCTION TO DOCUMENTATION

TEST

1. MULTIPLE CHOICE: Circle the letter of the correct answer.

   a. A ? is a graphic presentation of the logic required to solve a problem.

      1. formula
      2. flowchart
      3. decision table
      4. file

   b. A ? program performs necessary, but routine, jobs.

      1. utility
      2. package
      3. subroutine
      4. routine

   c. A graphic aid to problem solving is called a

      1. flowchart.
      2. file.
      3. formula.
      4. decision table.

   d. ? is the processing of gathering, organizing, storing, and indexing information into an orderly presentation.

      1. Programming
      2. Flowcharting
      3. Documentation
      4. Using

   e. A ? is expressed in algebraic symbols.

      1. formula
      2. flowchart
      3. user's manual
      4. UCL

   f. The ? serves as a link between the operating system and the application programs.

      1. I/O files
      2. JCS
      3. decision table
      4. JCL

   g. A group of instructions used a number of times in a program is known as a

      1. formula.
      2. subroutine.
      3. decision table.
      4. utility program.

h. The ? directs the computer and coordinates the operations of the various hardware components.

1. JCL
2. documentation
3. program package
4. I/O files

i. A set of documentation materials which explain the function and operation of a program/program package is called a

1. utility program.
2. user's manual.
3. flowchart.
4. JCL.

j. ? is the process of logically organizing information which will be generated in producing a computer program into a useful file.

1. Program packaging
2. Program documentation
3. Utility manual
4. Subroutine control

2. TRUE OR FALSE: Using "T" or "F", indicate if the following statements are true or false.

_____a. The documentation process should occur at all phases of the programming cycle.

_____b. Flowcharting creates opportunity for communication between programmer and user.

_____c. Documentation narrative should be written so that only data processing personnel can understand it.

_____d. Programmers are required to work with and communicate with data processing personnel who can understand it.

_____e. Programmers are required to work with and communicate with personnel who do not understand the technical language of data processing.

_____f. Communication is enhanced when documentation is written clearly and concisely.

_____g. In-program documentation is also called documentation narrative or flowcharting.

_____h. The programmer needs to work closely with systems analyst and with users during the problem definition phrase.

_____i. Job control statements are used to direct an operating system in its functions.

_____j. The definition of problems, the construction of flowcharts, and the writing of operating instructions are examples of documentation.

_____k. Organized groups of input or output records are called I/O files.

INTRODUCTION TO DOCUMENTATION

ANSWERS TO PRETEST

I. a. 6
   b. 10
   c. 1
   d. 12
   e. 3
   f. 9
   g. 5
   h. 2
   i. 11
   j. 11
   k. 4
   l. 12

2. a. To insure proper communication among systems analysts, programmers, and users.

   b. To assist in problem analysis.

   c. Program modification and updating are much easier when the program is properly documented.

   NOTE: The student may think of additional benefits not discussed in the information sheet. Each answer should be evaluated individually. Answers should be similar to the following:

3. a. Documentation narrative:

      1. Describes overall purpose.

      2. Describes input.

      3. Describes data manipulation, including formulas and subroutines.

      4. Describes output.

   b. Flowcharts--describe logic pictorially.

      1. User-oriented.

      2. Programmer-oriented.

   c. In-program documentation.

      Remark or comment statements make programs easier to read and understand.

4. Due to program and language differences, the language and difficulty of the program for this question will be left to the discrepancy of the instructor.

INTRODUCTION TO DOCUMENTATION

ANSWERS TO TEST

1. Multiple Choice.

    a. 2
    b. 1
    c. 4
    d. 3
    e. 1
    f. 4
    g. 2
    h. 3
    i. 2

2. True or False.

    a. T
    b. T
    c. F
    d. T
    e. T
    f. F
    g. T
    h. T
    i. T
    j. F

PROGRAM MAINTENANCE

UNIT OBJECTIVE

After completion of this unit, the student should possess a familiarity with the activities involved in program maintenance. This knowledge will be evidenced by completion of assignments and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to program maintenance to their correct definitions.
2. List activities involved in program maintenance.
3. Update a program to meet a changed requirement.
4. Modify a program for increased efficiency.
5. Update documentation for a modified program.
6. Retest a modified program.

PREREQUISITES

Basic Data Processing Concepts and Functions

Historical Development of Data Processing (optional)

Common Features of Data Processing Systems

Data Processing Applications and Careers (optional)

Introduction to Problem Analysis

Introduction to Flowcharting

Introduction to Programming Languages

Introduction to Documentation

PROGRAM MAINTENANCE

SUGGESTED ACTIVITIES

I. Instructor:

   A. Give pretest.

   B. Provide student with objective, information, and assignment sheets.

   C. Discuss unit and specific objectives.

   D. Discuss information and assignment sheets.

   E. Provide students with data for payroll program (Assignment Sheet #1).

   F. More complex revisions can be assigned for Assignment Sheet #2 if desired. Adjust the assignment to the skill level of your students.

   G. Assignment Sheet #3--Since different languages are used in different schools, a program is not provided in this unit for efficiency modification. Provide the students with one or more programs which need modification to improve efficiency.

   H. Give test.
   NOTE: Because of the wide range of computer systems available and languages taught in different institutions, programming problems are not included in the test. Problems appropriate for your course should be added.

II. Student:

   A. Take pretest.

   B. Read objective sheet.

   C. Study information sheet.

   D. Complete assignment sheets.

   E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

- A. Objective sheet.
- B. Information sheet.
- C. Assignment sheets: #1 - Write a Payroll Program.
  - #2 - Update a Payroll Program.
  - #3 - Modify a Program for Increased Efficiency.
  - #4 - Update Documentation.
  - #5 - Retest a Revised Program.
- D. Answers to assignment sheets
- E. Pretest and test
- F. Answers to pretest and test

II. References:

- A. Conger, Daniel J. and Fred R. McFadden. A First Course in Data Processing. Santa Barbara: John Wiley & Sons, Inc., 1977.
- B. Sipple, Charles J. and Charles P. Sipple. Computer Dictionary and Handbook. Indianapolis: Howard W. Sams & Co., Inc., 1966.
- C. Dock, Thomas V. and Edward Essick. Principles of Business Data Processing. Chicago: Science Research Associates, Inc., 1978.
- D. References available in your school.

PROGRAM MAINTENANCE

PRETEST

1. Match the terms on the right with the correct definition.

_____a. Change a program for application to new conditions.

_____b. Production of desired results with minimum time and cost.

_____c. The process of logically organizing information which will be generated in producing a computer program into a useful file that continually reflects the current state of the program.

_____d. After a program change, running a program with all possible types of sample input data that simulates conditions likely to be found in the real data that will be processed by the program.

_____e. To alter a portion of a program.

_____f. Refers to the people, equipment, procedures, and programs involved in an organized effort to accomplish specific and desired operations or tasks.

1. Efficiency
2. Modify
3. Program documentation
4. Retesting
5. System
6. Update

2. List 4 activities associated with program maintenance.

a.

b.

c.

d.

PROGRAM MAINTENANCE

INFORMATION SHEET

I. Terms and definitions

   A. Efficiency--Production of desired results with minimum time and cost.

   B. Modify--To alter a portion of a program.

   C. Program Documentation--The process of logically organizing information which will be generated in producing a computer program into a useful file that continually reflects the current state of the program; includes written text and flowcharts.

   D. Retesting--After a program change, running a program with all possible types of sample input data that simulates conditions likely to be found in the real data that will be processed by the program.

   E. System--A general term that refers to the people, equipment, procedures, and programs involved in an organized effort to accomplish specific and desired operations or tasks.

   F. Update--Change a program for application to new conditions.

II. Program maintenance functions

In a business setting, programmers often reuse programs which they have developed previously. The application may be exactly the same as when the program was developed, or it may be slightly different. When programmers refer back to previously written programs, documentation becomes increasingly important. The programmer must be able to identify the particular program appropriate for the current application and be able to make necessary revisions quickly and efficiently. Following are some activities associated with program maintenance.

III. Activities involved in program maintenance:

   A. Updating computer programs to meet changing requirements.

   B. Modifying computer programs for increased efficiency.

   C. Updating documentation of a modified program.

   D. Retesting programs when modified.

   E. Reviewing existing systems for compatibility with new technology.

   F. Retesting entire system when necessary.

PROGRAM MAINTENANCE

ASSIGNMENT SHEET #1--WRITE A PAYROLL PROGRAM

After constructing the algorithm and flowchart, write a program (in the language selected by your instructor) which will compute net weekly pay for a group of employees.

Input format is as follows:

Columns	1-25	Name
	27-28	Number of dependents
	30-33	Hourly rate xx.xx (no decimal punched)
	35-36	Hours worked

Weekly hours over 40 are paid at 1.5 time the regular rate. Income tax is computed as 18% of weekly wages. Net pay = Wages - Tax. Your output should show the employee's name, the hours worked, and net pay. Be sure to include appropriate documentation with your program.

PROGRAM MAINTENANCE

ASSIGNMENT SHEET #2--UPDATE A PAYROLL PROGRAM

In a business setting, computer programs are often reused many times. If conditions change, which require a change in some part of a program, the program must be modified to reflect that change. For this assignment, imagine that you are the programmer addressed in the following memo. Make the changes requested in the memo in the program you wrote for Assignment Sheet #1. You may want to modify your program to make future changes even easier to make.

TO: Programmer

FROM: Accounting Department

SUBJECT: Payroll Changes

The following changes will be in effect as of the next payroll period:

1. Overtime rate will be 1.75 times hours worked over 40.
2. Income tax rate will be changed to 21 percent.

Please revise the payroll program to reflect these changes before the next payroll period.

PROGRAM MAINTENANCE

ASSIGNMENT SHEET #3--MODIFY A PROGRAM FOR INCREASED EFFICIENCY

For this assignment, your instructor will supply you with a program written in a language with which you are familiar. The program needs to be improved in terms of computer time usage. Our job is to change the program to be more efficient. Construct a flowchart from the program to help you analyze the program.

PROGRAM MAINTENANCE

ASSIGNMENT SHEET #4--UPDATE DOCUMENTATION

You made program changes in Assignment Sheets #2 and #3; now update the documentation for these two programs.

PROGRAM MAINTENANCE

ASSIGNMENT SHEET #5--RETEST A REVISED PROGRAM

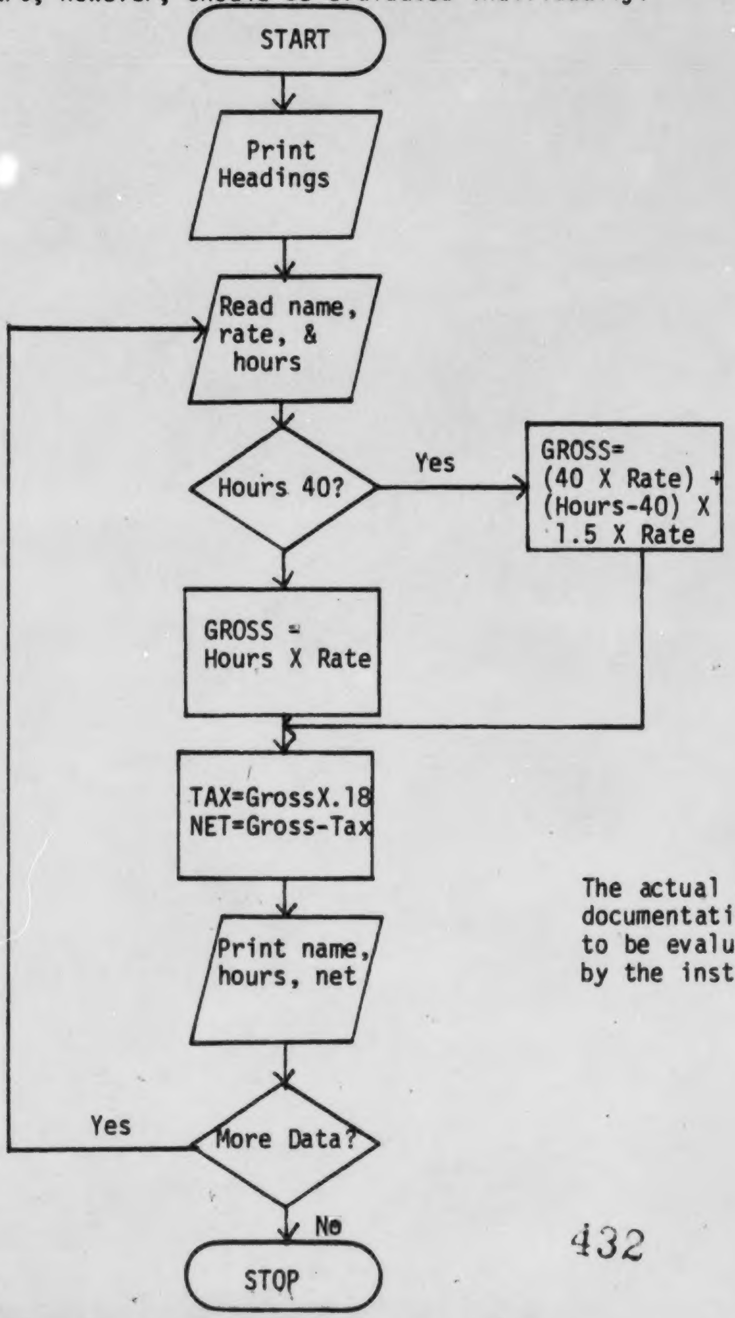
Whenever a program is revised or updated, it must be retested to make sure it performs as intended; retest the two programs in which you made changes.

PROGRAM MAINTENANCE

ANSWERS TO ASSIGNMENT SHEETS

ASSIGNMENT SHEET #1

The following flowchart is one solution for this program. Each student's flowchart, however, should be evaluated individually.


START
Print Headings
Read name, rate, & hours
Hours 40?
Yes
GROSS= (40 X Rate) + (Hours-40) X 1.5 X Rate
GROSS = Hours X Rate
TAX=GrossX.18
NET=Gross-Tax
Print name, hours, net
Yes
More Data?
No
STOP

The actual coding and documentation will need to be evaluated individually by the instructor.

PROGRAM MAINTENANCE

ANSWERS TO ASSIGNMENT SHEETS

ASSIGNMENT SHEETS 2-5

Solutions for these assignments will need to be evaluated individually because of the wide range of programming languages used in different institutions.

PROGRAM MAINTENANCE

TEST

TRUE or FALSE. Using "T" or "F", indicate if the following statements are true or false.

_____a. The retesting of programs and entire systems are part of program maintenance.

_____b. To change a program for application to new conditions is to modify a program.

_____c. Program maintenance involves the updating of computer programs when a programmer has to run the program.

_____d. When a program is modified, a portion of a program is altered.

_____e. A system is a general term that refers to the people, equipment, procedures, and programs involved in an organized effort to accomplish specific and desired operations or tasks.

_____f. A programmer must be able to identify the particular program appropriate for the current application and be able to make necessary revisions quickly and efficiently.

PROGRAM MAINTENANCE

ANSWERS TO PRETEST

1. a. 6
   b. 1
   c. 3
   d. 4
   e. 2
   f. 5

2. Answers may be in any order; use four from the following list:
   1. Updating computer programs to meet changing requirements.
   2. Modifying computer programs for increased efficiency.
   3. Updating documentation for a modified program.
   4. Retesting programs when modified.
   5. Reviewing existing systems for compatability with new technology.
   6. Retesting entire system when necessary.

PROGRAM MAINTENANCE

ANSWERS TO TEST

True or False.

a. T
b. F
c. F
d. T
e. T
f. T
g. F
h. T
i. F
j. T

ANALYZING EXISTING SYSTEMS

UNIT OBJECTIVE

After completion of this unit, the student should be familiar with what a systems study is and how it is conducted, and methods in analyzing the existing system. This knowledge will be evidenced through assignments and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to analyzing existing systems to the correct definitions.
2. List conditions that might cause a systems study to be undertaken.
3. List objectives of a preliminary study.
4. List objectives of a detailed study.
5. Explain methods used in analyzing the present system.

PREREQUISITES

Introduction to Problem Analysis

Introduction to Flowcharting

Introduction to Program Language

Introduction to Documentation

Program Maintenance

ANALYZING EXISTING SYSTEMS

SUGGESTED ACTIVITIES

I. Instructor:
  A. Give pretest.
  B. Provide student with objective sheet.
  C. Provide student with information and assignment sheets.
  D. Discuss unit and specific objectives.
  E. Discuss information and assignment sheets.
  F. Give test.

II. Student:
  A. Take pretest.
  B. Read objective sheet.
  C. Study information sheets.
  D. Complete assignment sheets.
  E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:
  A. Objective sheet.
  B. Information sheets.
  C. Assignment sheets: #1--Preliminary Study.
     #2--Detailed Study.
  D. Pretest and test.
  E. Answers to pretest and test.

II. References:

A. Cleland, David I. and William R. King. *Management: A Systems Approach.* New York: McGraw-Hill Book Company, 1972.

B. Clifton, H. D. *Systems Analysis for Business Data Processing.* Princeton: Auerbach Publishers, Inc., 1969.

C. Condon, Robert J. *Data Processing Systems Analysis & Design,* second edition. Reston, Virginia: Reston Publishing Company, Inc., 1978.

D. Gildersleeve, Thomas R. *Successful Data Processing System Analysis*. New Jersey: Prentice-Hall, Inc., 1978.

E. References available in your school.

ANALYZING EXISTING SYSTEMS

PRETEST

1. Match the terms on the right to the correct definition.

    _____a. A study conducted after a systems study request has been made. This study defines the problem more clearly, decides if a more detailed study is necessary, and if so, estimates time and personnel needs.

    _____b. An oral and/or written synopsis of the results of the detailed study. It should:
    1. Identify the problem in detail.
    2. Identify alternative courses of action (suggested solutions).
    3. Summarize and make final recommendations.

    _____c. Responsible for the analyzing, designing, evaluating, and implementing of systems.

    _____d. An analysis of the way something is being done; to see if the procedure should stay the same, be changed slightly, or be changed completely.

    _____e. The length of time, estimated cost, and number of persons needed to accomplish the established goal.

    1. Preliminary study
    2. Scope of study
    3. Systems department
    4. Systems study
    5. Systems proposal

2. List 3 conditions that may cause management to request a systems study.

    a.

    b.

    c.

3. List 4 objectives of a preliminary study.

   a.

   b.

   c.

   d.

4. List 5 objectives of a detailed study.

   a.

   b.

   c.

   d.

   e.

5. Explain 3 methods used in analyzing a system presently in use.

a.

b.

c.

ANALYZING EXISTING SYSTEMS

INFORMATION SHEET

I. Terms and definitions

A. Preliminary study--A study conducted after a systems study request has been made. This study defines the problem more clearly, decides if a more detailed study is necessary, and if so, estimates time and personnel needs.

B. Scope of study--The length of time, estimated cost, and number of persons needed to accomplish the established goal.

C. Systems department--Responsible for the analyzing, designing, evaluating, and implementing of systems.

D. Systems study--An analysis of the way something is being done; to see if the procedure should stay the same, be changed slightly, or be changed completely.

E. Systems Proposal--An oral and/or written synopsis of the results of the detailed study. It should:
   1. Identify the problem in detail.
   2. Identify alternative courses of action (suggested solutions).
   3. Summarize and make final recommendations.

II. Conditions that might cause a systems study to be undertaken:

A. Too many errors in input or output.

B. Inadequate or late reports.

C. Customer complaints.

D. Present system not able to handle future demands.

E. Present methods of handling data are obsolete.

F. New equipment might do the job faster, more accurately, and cost less.

III. Objectives of a preliminary study.

A. Define the problem.

B. Decide if a more detailed study is necessary.

C. Provide management with interim reports.

D. Provide a final report to management, making one of the following recommendations:

   a. No additional action is necessary.

   b. Minor changes are necessary.

   c. Major changes of the system are needed.

IV. Objectives of a detailed study

   A. Determine scope and goals of the study.

   B. Analyze present system.

   C. Forecast future requirements of the system.

   D. Evaluate alternative solutions for present and anticipated requirements.

   E. Evaluate hardware.

   F. Evaluate software.

   G. Compare system to accepted industry standards.

   H. Develop a system proposal for formal presentation to management.

V. Methods used in analyzing the present system:

   A. Interview all persons involved with the system, verbally or with a questionnaire.

   B. Review statistics on time and cost of transaction.

   C. Read all company documents, sales literature, memos, letters, surveys, etc., pertaining to all operations of the system.

   D. Observe actual workings of department; watch procedures.

   E. Evaluate present office layout and data flow.

ANALYZING EXISTING SYSTEMS

ASSIGNMENT SHEET #1--PRELIMINARY STUDY

INSTRUCTIONS: On an individual basis, work through the following case. After answering the questions, get together with fellow classmates to discuss your responses.

TO COMPUTERIZE OR NOT TO COMPUTERIZE

The payroll system at the Sports Shop is run manually even though the company has had automated equipment for 10 years. Last week, Ray Jones, the controller, wrote a memo to Richard Smith, the director of data processing.

TO: Richard Smith

FROM: Ray Jones

DATE: May 29, 19--

RE: Computerizing the Payroll System

For several years we have discussed computerizing the payroll system, but for one reason or another it wasn't possible. I think the time has come to take another look at the problem.

Within the past 7 years, we have expanded our staff from 225 to 1,900. The payroll section has only seven people in it, and because of the complexity of the payroll, with overtime, part-time, hourly and salaried employees, we find ourselves particularly hard-pressed to get the payroll out on time.

A computerized payroll could accomplish the following:

1. Payment of all employees on time.
2. A substantial reduction in the cost of producing the payroll.
3. Generation of statistics on employee utilization and turnover.

Would you give this suggestion high priority?

One week later Richard Smith sent the following memo:

TO: Ray Jones
FROM: Richard Smith
DATE: June 13, 19--
RE: Computerizing the Payroll System

It has been decided to do a preliminary study of your proposal for a computerized payroll system. We think the timing of your proposal is good. I have assigned one of my finest systems analysts to conduct the survey.

You have been appointed project leader.

1. Identify the purpose of a preliminary study.
2. Make a list of the questions you will ask Ray Jones when you interview him.
3. Who else would you like to talk to in Ray's organization? Make a list of prospective interviewers and include questions you would ask.
4. What talent do you require of your team members?

ANALYZING EXISTING SYSTEMS

ASSIGNMENT SHEET #2--DETAILED STUDY

INSTRUCTIONS: Working in a small group, develop your answers to this problem.

COMPUTERIZED STUDENT DATA FILE

The student government association at Mid-State Community College is concerned that there is no existing master file with student data available. The association is considering compiling a roster of all students enrolled at the college. Mid-State has about 7,500 students enrolled in various one-and two-year programs.

Three weeks ago the president of the Student Government Association submitted the following memo to the association:

> As of September 1, there are about 7,500 students enrolled at Mid-State Community College. As president of the Student Government Association, I feel that it is essential that we have a record of each student and a direct means of contacting each of them. Moreover, since we have numerous requests from students to produce a class roster, the compilation of a master file on punch cards could provide us with the basic information required. I recommend that the Association appoint a committee to look into the possibility of producing this file.

Your group has been appointed to conduct a detailed study of the request. A preliminary study determined:

1. The college administration has no punch card records that could be used to produce the master file.
2. The college will allow you the use of its computer at a minimal cost. The college has a modern computer capable of handling punch cards, magnetic tapes, and disk files.
3. The college will allow the student council access to the manual files it requires to complete its roster.

Conduct a meeting of the committee.

1. What steps must your group take to complete a detailed study?
2. What assumptions have you made?

3. What questions do you have for the president?
4. What data should the file include?
5. What additional uses do you see for this file? List advantages and disadvantages developing alternative courses of action.

Prepare a report for the association, indicating the results of the meeting and the direction in which the committee is proceeding.

ANALYZING EXISTING SYSTEMS

TEST

1. TRUE OR FALSE. Using "T" or "F", indicate if the following statements are true or false.

_____a. An objective of a preliminary study is to define the problem more clearly and to decide if a more detailed study is necessary.

_____b. When the present system cannot handle future demands, this may cause a systems study to be undertaken.

_____c. A detailed study analyzes the present system.

_____d. One method used in analyzing a system is to compare the system to industry standards.

_____e. Evaluation of hardware and software takes place prior to a detailed study.

_____f. A systems study may be undertaken when the present methods of handling data are obsolete.

_____g. The recommendation that minor changes are necessary to the system could be part of the final report of the preliminary study.

_____h. When analyzing the present system, all persons involved with the system should be interviewed.

_____i. A detailed study provides interim reports to management.

_____j. An analysis of the way something is being done is referred to as the scope of a systems study.

2. MULTIPLE CHOICE: Circle the letter of the correct answer.

a. A study which defines a problem more clearly and decides if a further study is necessary is called the

1. scope of study.
2. detailed study.
3. preliminary study.
4. systems study.

b. Too many errors in input or output and late or inadequate reports may cause a (an)

1. preliminary study.
2. systems study.
3. detailed study.
4. analystical systems study.

c. The ? is responsible for the analyzing, designing, evaluating, and implementing of systems.

   1. detailed study committee
   2. programmer analysis
   3. vice-president of operations
   4. systems department

d. Observing work procedure and evaluating office layout and data flow are methods used

   1. when analyzing the present system.
   2. by vice-presidents to see if employees are happy.
   3. in determining the scope of a study.
   4. when providing management with the definition of a systems problem.

e. The ? is the length of time, estimated cost and number of persons needed to accomplish an established goal.

   1. systems analysis
   2. scope of study
   3. systems budget
   4. systems study

ANALYZING EXISTING SYSTEMS

ANSWERS TO PRETEST

1. a. 1 c. 3 e. 2
   b. 5 d. 4

2. Answers may appear in any order and may be three of the following.
   a. Too many errors in input or output.
   b. Inadequate or late reports.
   c. Customer complaints.
   d. Present system not able to handle future demands.
   e. Present methods of handling data are obsolete.
   f. New equipment might do the job faster, more accurately, and cost less.

3. Answers may appear in any order.
   a. Defines the problem.
   b. Decides if a more detailed study is necessary.
   c. Provides management with interim reports.
   d. Final report to management makes one of the following recommendations:
      1. No additional action is necessary.
      2. Minor changes are necessary.
      3. Major changes of the system are needed.

4. Answers may appear in any order and may be any five of the following eight.
   a. Determine scope and goals of the study.
   b. Analyze present system.
   c. Forecast future requirements of the system.
   d. Evaluate alternative solutions for present and anticipated requirements.
   e. Evaluate hardware.
   f. Evaluate software.

g. Compare system to accepted industry standards.

h. Develop a system proposal for formal presentation to management.

5. Answers may appear in any order and may be three of the following:

a. Interview all persons involved with the system, verbally or with a questionnaire.

b. Review statistics on time and cost of transaction.

c. Read all company documents, sales literature, memos, letters, surveys, etc., pertaining to all operations of the system.

d. Observe actual workings of department; watch procedures.

e. Evaluate present office layout and data flow.

ANALYZING EXISTING SYSTEMS

ANSWERS TO TEST

1. True or False.

   a. T
   b. T
   c. T
   d. F
   e. F
   f. T
   g. T
   h. T
   i. F
   j. F

2. Multiple Choice.

   a. 3
   b. 2
   c. 4
   d. 1
   e. 2

SYSTEMS SPECIFICATIONS

UNIT OBJECTIVE

After completion of this unit, the student should be knowledgeable of the important aspects of documenting a system. This knowledge will be evidenced by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Define documentation.
2. Explain in writing why good documentation is critical.
3. Explain in writing why good documentation is often not produced.
4. List the steps in developing documentation.
5. List types of information that should be included in the documentation of a system.

PREREQUISITES

Introduction to Documentation

Analyzing Existing Systems

SYSTEMS SPECIFICATIONS

SUGGESTED ACTIVITIES

I. Instructor:

- A. Give pretest.
- B. Provide student with objective sheet.
- C. Provide student with information sheets.
- D. Discuss unit and specific objectives.
- E. Discuss information sheets.
- F. Give test.

II. Student:

- A. Take pretest.
- B. Read objective sheet.
- C. Study information sheets.
- D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

- A. Objective sheet.
- B. Information sheets.
- C. Pretest and test.
- D. Answers to pretest and test.

II. References:

A. Cleland, David I. and William R. King. Management: A Systems Approach. New York: McGraw-Hill Book Company, 1972.

B. Clifton, H. D. Systems Analysis for Business Data Processing. Princeton: Auerbach Publishers, Inc., 1969.

C. Condon, Robert J. Data Processing Systems Analysis & Design, second edition. Reston, Virginia: Reston Publishing Company, Inc., 1978.

D. Gildersleeve, Thomas R. Successful Data Processing System Analysis. New Jersey: Prentice-Hall, Inc., 1978.

E. References available in your school.

SYSTEMS SPECIFICATIONS

PRETEST

1. Define documentation.

2. Discuss 3 reasons why good documentation is critical to the system.

   a.

   b.

   c.

3. Discuss 3 reasons why good documentation is often not produced.

   a.

   b.

   c.

4. List, in order, the 7 steps that should be followed in developing documentation.

5. List 5 types of information that should be included in the documention of a system.

SYSTEMS SPECIFICATIONS

INFORMATION SHEET

I. What is documentation?

Documentation is the process of gathering, organizing, storing, and indexing information into an orderly presentation. Documentation of a computer program includes a written text and flowcharts, which indicate the purpose, functions, and operational details of a program.

II. Why good documentation is critical.

A. The person who designed the procedure or wrote the program may not be available to make modifications because of job turnover.

B. Because of a high volume of output, the original analyst or programmer, though still on hand, may have forgotten many of the vital details. Without good documentation, the analyst must waste time refamiliarizing himself or herself with the original plan.

C. Modern operating systems require a large amount of detail with regard to files, labels, communications, assignments, and other matters that must be consistently handled.

D. Eventually, the most frequently run jobs will be converted to new equipment. Good documentation greatly facilitates this conversion.

E. Changes in federal laws, tax rates, record structure and other data are probable over a period of time. Good documentation speeds the process of making changes to the programs.

F. Good documentation improves communication of systems specifications from analyst to programmer. It conveys the programmer's plan to the operator and provides complete and formalized instruction at each step in the processing cycle.

III. Why good documentation is often not produced.

A. The pressures of everyday business often leaves little time for the systems or programming personnel to document what has been done.

B. Writing documentation is an unglamorous job. Analysts and programmers feel their talents should not be wasted on documentation, but rather they should be concerned with solving problems of system design, development, and implementation.

C. There exists a lack of uniform documentation standards. Programmers seem to react poorly to vaguely defined specifications.

IV. Steps in developing documentation.

A. Study concepts and data of the system; conferring with those who have been involved.

B. Write the first draft; determining style, length and complexity.

C. Edit for clarity, style and format.

D. Type, illustrate, reproduce, and proofread the document.

E. Final editing should be done by senior persons within the data processing systems department.

F. Print final document.

G. Distribute the final document.

V. What should be included in the documentation of a system.

Complete documentation includes flowcharts, decision tables, written procedures, detailed forms design, and inputooutput specifications.

The person writing the documentation must include a:

1. general flowchart of the system.
2. list of all the runs in a system.
3. finalized version of all input/output forms.
4. layout of the files affected.
5. explanation of the coding structure to be used.
6. list of exceptions to the system.

SYSTEMS SPECIFICATIONS

TEST

1. REARRANGEMENT: The following statements are to be rearranged in order of procedure. Using numerals 1 - 7, 1 will be the first step, 7 the last.

   Steps in Developing Documentation:

   _____a. Write the first draft; determining style, length and complexity.

   _____b. Type, illustrate, reproduce, and proofread the document.

   _____c. Distribute the final document.

   _____d. Print final document.

   _____e. Study concepts and data of the system, conferring with those who have been involved.

   _____f. Final editing should be done by senior persons within the data processing systems department.

   _____g. Edit for clarity, style and format.

2. TRUE STATEMENTS: Circle the letters of all true statements.

   a. Good documentation improves communication of systems specifications from analyst to programmer.

   b. A finalized version of all output must be included in documentation.

   c. Complete documentation should include flowcharts, decision tables, written procedures, detailed forms design, and the final printed document.

   d. Since the person who designed the program may not be available to make modifications, good documentation is critical.

   e. The person writing documentation should include an explanation of the coding structure to be used, as well as, a list of exceptions to the system.

   f. The process of gathering, organizing, storing, and indexing into an orderly presentation is known as systems specifications development.

   g. Analysts and programmers feel their talents should be applied to solving problems of systems design, development, and implementation; thus, good documentation is often not produced.

h. With good documentation, the analyst need not waste time refamiliarizing himself or herself with the original plan.

i. When the most frequently run jobs are converted to new equipment, documentation is not necessary in facilitating this conversion.

SYSTEMS SPECIFICATIONS

ANSWERS TO PRETEST

1. Answer should be similar to the following:

   Documentation is the process of gathering, organizing, storing, and indexing information into an orderly presentation. Documentation of a computer program includes a written text and flowcharts, which indicate the purpose, functions, and operational details of a program.

2. Answers may be in any order, but should come from the following six areas:

   a. Job turnover

   b. High volume of output

   c. Complexity of modern systems

   d. Conversion of jobs to new equipment

   e. Changes to program

   f. Good communication tool

3. Answers may be in any order, but should be similar to the following:

   a. Pressures of everyday business.

   b. Documentation writing is unglamorous.

   c. Lack of uniform documentation standards.

4. Answers should be in the following order.

   a. Study concepts and data of system.

   b. Write first draft.

   c. Edit.

   d. Type, illustrate, reproduce, and proofread.

   e. Final editing.

   f. Final printing.

   g. Distribute.

5. Answers may appear in any order and may be five of the following ten.

   a. Flowcharts
   b. Decision tables
   c. Written procedures
   d. Forms design
   e. Input/output specifications
   f. Runs of the system
   g. Final version of input/output forms
   h. Layout of files
   i. Coding structure
   j. Exceptions to the system

SYSTEMS SPECIFICATIONS

ANSWERS TO TEST

1. Rearrangement.

    a. 2
    b. 4
    c. 7
    d. 6
    e. 1
    f. 5
    g. 3

2. True Statements.

    a. T
    b. F
    c. F
    d. T
    e. T
    f. F
    g. T
    h. T
    i. F

DESIGN AND DEVELOP SYSTEMS

UNIT OBJECTIVE

After completion of this unit, the student should have an understanding of how a system is designed. This knowledge will be evidenced through assignments and by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to systems design to the correct definition.
2. Describe how a systems design begins; listing important tasks relevant to systems design.
3. List factors vital to systems design.
4. Describe tasks in developing a system.

PREREQUISITES

Introduction to Problem Analysis

Introduction to Flowcharting

Introduction to Programming Languages

Introduction to Documentation

Program Maintenance

Analyzing Existing Systems

Systems Specifications

DESIGN AND DEVELOP SYSTEMS

SUGGESTED ACTIVITIES

I. Instructor:

- A. Give pretest.
- B. Provide student with objective sheet.
- C. Provide student with information and assignment sheets.
- D. Discuss unit and specific objectives.
- E. Discuss information and assignment sheets.
- F. Give test.

II. Student:

- A. Take pretest.
- B. Read objective sheet.
- C. Study information sheets.
- D. Complete assignment sheets.
- E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

- A. Objective sheet.
- B. Information sheets.
- C. Assignment sheet #1--Systems Design.
- D. Pretest and test.
- E. Answers to pretest and test.

II. References:

A. Cleland, David I. and William R. King. *Management: A Systems Approach*. New York: McGraw-Hill Book Company, 1972.

B. Clifton, H. D. *Systems Analysis for Business Data Processing.* Princeton: Auerbach Publishers, Inc., 1969.

C. Condon, Robert J. *Data Processing Systems Analysis & Design*, second edition. Reston, Virginia: Reston Publishing Company, Inc., 1978.

D. Gildersleeve, Thomas R. *Successful Data Processing System Analysis.* New Jersey: Prentice-Hall, Inc., 1978.

E. References available in your school.

DESIGN AND DEVELOP SYSTEMS

PRETEST

1. Match the terms on the right to the correct definition.

_____a. A series of related operations with similar design considerations.

_____b. All the information related to a specific subject area.

_____c. A group of related fields.

_____d. A group of related records.

_____e. A general term that refers to the people, equipment, procedures, and programs involved in an organized effort to accomplish specific and desired operations or tasks.

_____f. A file that is updated regularly, containing permanent data rather than detailed information of a temporary nature.

_____g. An integrated system of files providing information on a variety of subjects.

_____h. A program or collection of programs that may be rented or purchased.

_____i. An area of a record that is allocated for a specific category of data.

_____j. The field that distinguishes one record from another. It usually contains a number for identification purposes.

1. Data bank
2. Data base
3. Field
4. File
5. Key field
6. Master file
7. Record
8. Software package
9. Sub-system
10. System

2. Describe how a systems design begins and list 5 tasks relevant to systems design.

3. List 5 factors vital to systems design.

   a.

   b.

   c.

   d.

   e.

4. Given the 5 tasks you listed in question 2, describe each.

   a.

   b.

   c.

   d.

   e.

DESIGN AND DEVELOP SYSTEMS

INFORMATION SHEET

I. Terms and definitions:

A. Data bank--An integrated system of files providing information on a variety of subjects.

B. Data base--All the information related to a specific subject area.

C. Field--An area of a record that is allocated for a specific category of data. For example: a group of positions used to represent a wage rate; a location that contains certain information like first or last name.

D. File--A group of related records.

E. Key field--The field that distinguishes one record from another. It usually contains a number for identification purposes.

F. Master file--A file that is updated regularly, containing permanent data rather than detailed information of a temporary nature.

G. Record--A group of related fields.

H. Software package--A program or collection of programs that may be rented or purchased.

I. Sub-system--A series of related operations with similar design considerations.

J. System--A general term that refers to the people, equipment, procedures and programs involved in an organized effort to accomplish specific and desired operations or tasks.

II. Beginning systems design

The detailed study provides a plan for designing, testing and implementing a system. Theoretically, the systems design stage of the systems development plan takes the proposed system from the detailed study through program design.

The systems designer starts with an analysis of the hardware and software available, including investigating software packages. The designer then converts the detailed plan into the following tasks:

1. Identifying vital factors.

2. Dividing the system into workable sub-systems.

3. Organizing a data base.

4. Listing program considerations that will meet the systems objectives.
5. Developing input and output documents.
6. Documenting the systems design.
7. Developing the master file.
8. Reviewing the system.
9. Obtaining the necessary hardware.

III. Factors vital to systems design.

Systems design begins with identifying the needs of the system. Some factors to be considered when designing a system are:

1. Systems should be designed to the satisfaction of the user.
2. Systems should be simple, practical, and flexible.
3. Systems should be designed to meet the needs of the people who will work with them.
4. Systems should be designed so they can be easily monitored.
5. Systems should be designed to meet present, as well as, future needs.

IV. Developing a system.

A. A system of any reasonable size is divided into workable segments, consisting of a series of related operations with similar design considerations. These segments are determined by defining the major tasks to be performed. Work schedules are drawn up, and a budget is developed for each segment.

B. The organization of a data base is the bringing together of all the information related to a specific application. Organizing such a data base is a complex project. Determining the cost of a data base requires that the systems analyst have knowledge as to how much of an organization's data is already in machine-readable form.

C. The systems designer must develop programs to meet the systems objectives. A decision must be made as to:

   1. What programs must be written.
   2. How complex must each program be.
   3. How do the programs relate to each other.
   4. Who will write the programs.

5. What will be the procedures to test the programs.

6. How much time is needed to develop each program; how much time is available.

D. Documentation should be prepared during the design phase so that users have adequate time to become familiar with the new system.

E. A master file of records is a typical part of a data processing system. The analyst first determines the controlling field and then identifies each element that will be required in the record. These elements include those in the present system and those proposed.

Master files are ever changing as a result of input transactions and they are important to output, providing easy retrieval of data. Since the file is a source of information, the analyst must determine the following when developing the master file:

1. What is the frequency of inquiries; how are transactions processed.

2. What method should be used in displaying the status of the file.

3. What is the most convenient sequence for the file; must there be a sequence.

4. Should the sequence be alphabetical or numerical.

F. A review of the proposed system by the key users is essential in order to avoid possible breakdowns in the development of the system. Interaction with users allows for better acceptance of the system and could make the difference between success and failure.

DESIGN AND DEVELOP SYSTEMS

ASSIGNMENT SHEET #1--SYSTEMS DESIGN

Instructions: Working with a small group, develop your answers to this problem.

Mid-State Community College has had a computer for three years. The computer has been used exclusively for educational purposes as all the college's data processing work has been done either manually or at a service bureau. Dr. Michael Smith, the new president of Mid-State, has put the creation of a management information system near the top of his priorities for the next two years.

The college's administrative systems department, in conjunction with a faculty committee and the representatives of the student government association, conducted a detailed study for developing a management information system. The group concluded that first priority should be given to computerizing the students' records. The detailed report anticipated that the master file for the system would be contained on a disk pack. The system would be designed to produce:

1. A grade report after each semester, which would be mailed to the student's home. The report would include the grades for the semester completed, all previous grades recorded at the school, the grade average for the current semester, and the accumulated average.

2. A transcript, upon request.

3. Statistical data for the registrar's office.

Students graduating from Mid-State usually accumulate 64 credits, but a few have completed more than 100 at the school. All courses are worth either 3 or 4 credits. The system requires that credits completed at other colleges and transferred to Mid-State be indicated. Mid-State uses a letter grading system (A, B, C, D, F, W).

1. What general information is needed to develop a master file?

2. Determine what statistical data should be contained in the master file?

3. What must a systems designer know about the processing of the transactions of the present system? Why is it important?

DESIGN AND DEVELOP SYSTEMS

TEST

1. TRUE OR FALSE: Using "T" or "F", indicate if the following statements are true or false.

_____a. A systems designer starts with an analysis of the hardware and software available.

_____b. Systems should be designed to meet the fancy of the people who are developing them.

_____c. In order to meet the systems objectives, it must be decided what programs must be written and by whom.

_____d. A detailed study provides a plan for testing and measuring a system.

_____e. Systems should be designed so they can be easily monitored.

_____f. Documentation should be prepared after the development stage so that designers can become familiar with the new system.

_____g. Master files, once developed, remain constant until the system is discarded.

_____h. The development of input/output documents and a master file are tasks related to beginning a systems design.

_____i. A review of a proposed system by the president and vice president of the company is essential to the development of a system.

_____j. The organization of a data base is accomplished by bringing together all the information related to a specific application.

2. MATCHING: Match the terms listed to the correct definition.

1. Data bank
2. Data base
3. Field
4. File
5. Key field
6. Master file
7. Record
8. Software package
9. Sub-system
10. System

_____a. A general term that refers to the people, equipment, procedures, and programs involved in an organized effort to accomplish specific and desired operations or tasks.

_____b. A group of related records.

_____c. A program or collection of programs that may be rented or purchased.

_____d. A file that is updated regularly, containing permanent data rather than information of a temporary nature.

_____e. A series of related operations with similar design considerations.

_____f. Integrated system of files providing information on a variety of subjects.

_____g. The field that distinguishes one record from another.

_____h. An area of a record that is allocated for a specific category of data.

_____i. Group of related fields.

_____j. All the information related to a specific subject area.

DESIGN AND DEVELOP SYSTEMS

ANSWERS TO PRETEST

1. a. 9
   b. 4
   c. 7
   d. 4
   e. 10
   f. 6
   g. 1
   h. 8
   i. 3
   j. 5

2. Answers should be similar to the following; the student should include five tasks from the nine listed:

   1. Identifying vital factors.
   2. Dividing the system into workable sub-system.
   3. Organizing a data base.
   4. Listing program considerations that will meet the systems objectives.
   5. Developing input and output documents.
   6. Documenting the systems design.
   7. Developing the master file.
   8. Reviewing the system.
   9. Obtaining the necessary hardware.

3. Answers may appear in any order.

   1. Systems should be designed to the satisfaction of the user.
   2. Systems should be simple, practical, and flexible.
   3. Systems should be designed to meet the needs of the people who will work with them.
   4. Systems should be designed so they can be easily monitored.
   5. Systems should be designed to meet present, as well as, future needs.

4. Answers should be similar to the information listed under IV of the Information Sheet.

DESIGN AND DEVELOP SYSTEMS

ANSWERS TO TEST

1. True or False.

a. T
b. F
c. T
d. F
e. T
f. F
g. F
h. T
i. F
j. T

2. Matching.

a. 10
b. 4
c. 8
d. 6
e. 9
f. 1
g. 5
h. 3
i. 7
j. 4

SYSTEMS IMPLEMENTATION

UNIT OBJECTIVE

After completion of this unit, the student should be knowledgeable of the important aspects of implementing a system. This knowledge will be evidenced by scoring 90% on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Define implementation and conversion.
2. List steps that must be scheduled and accomplished between the ordering of equipment and the installing of it.
3. List methods of implementing a new system.
4. List methods of controlling the implemention plan.
5. Describe how a system can be maintained.

PREREQUISITES

Introduction to Problem Analysis

Introduction to Flowcharting

Introduction to Programming Languages

Introduction to Documentation

Program Maintenance

Analyzing Existing Systems

Systems Specifications

Design and Develop Systems

SYSTEMS IMPLEMENTATION

SUGGESTED ACTIVITIES

I. Instructor:

  A. Give pretest.

  B. Provide student with objective sheet.

  C. Provide student with information sheets.

  D. Discuss unit and specific objectives.

  E. Discuss information sheets.

  F. Give test.

II. Student:

  A. Take pretest.

  B. Read objective sheet.

  C. Study information sheets.

  D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objective sheet.

  B. Information sheets.

  C. Pretest and test.

  D. Answers to pretest and test.

II. References:

A. Cleland, David I. and William R. King. Management: A Systems Approach. New York: McGraw-Hill Book Company, 1972.

B. Clifton, H. D. Systems Analysis for Business Data Processing. Princeton: Auerbach Publishers, Inc., 1969.

C. Condon, Robert J. Data Processing Systems Analysis & Design, second edition. Reston, Virginia: Reston Publishing Company, Inc., 1978

D. Gildersleeve, Thomas R. Successful Data Processing System Analysis. New Jersey: Prentice-Hall, Inc., 1978.

E. References available in your school.

SYSTEMS IMPLEMENTATION

PRETEST

1. Define implementation and conversion.

2. List 5 steps that must be scheduled and accomplished between the ordering of equipment and the installing of it.

   a.

   b.

   c.

   d.

   e.

3. List 4 methods of implementing a new system.

   a.

   b.

   c.

   d.

4. List 4 methods of controlling the implementation plan.

   a.

   b.

   c.

   d.

5. Describe how a system can be maintained.

SYSTEMS IMPLEMENTATION

INFORMATION SHEET

I. Definition of implementation and conversion.

Implementation: The process of installing a computer system. This process begins when the new system has been approved by top management and the new equipment has been placed on order.

Conversion: The process of changing from one data processing method to another. The transition between the old and the new system.

II. Scheduling change.

Once top management has made a decision to adopt a new system, and a systems design has been accomplished, a time schedule must be set up for the actual conversion and implementation. If any equipment is needed, it is usually ordered first because the delivery time will have a major affect on the schedule.

Certain steps that must be scheduled and accomplished between the ordering of equipment and the installing are:

1. Staffing of personnel. Are more people needed on a temporary or full-time basis; what assignments or duties must be changed; cost of overtime must be considered.
2. Actual detailed programming should be done.
3. Conversion of files.
4. A trial run of information through the entire system, using actual information, should be arranged.
5. Prepare the facilities. Review traffic flow, working space, telephone hookups, etc.
6. Train all levels of personnel either in-house or through vendors.
7. All documentation should be kept current.

III. Methods of implementing a new system.

A. All-at-once: As of a certain time and date, the total system will go into effect. Used if system is fairly simple; there are no alternatives if there is trouble.

B. Piecemeal: Used for large projects. This method takes longer because each segment is installed and tested before going on to next segment.

C. Parallel: Involves the continuation of the old system for a period of time after the new system has begun operation. It's costly, but it provides time to compare results and serves as a self-check on the new system. Also allows for on-the-job teaching for old system personnel by rotating them onto the new system for a specified period.

D. Pilot Installation: Used in large widespread organizations. One branch, region, or department is selected to implement the system using previously mentioned methods. When the system is running smoothly, the system is installed in the total organization.

IV. Controlling the implementation plan.

A. Check periodically to verify that the prescribed schedule is being adhered to.

B. The use of checks and balances of all accounting procedures should be built into the system.

C. Paper flow controls should be implemented through use of log sheets, transmittal records, document sheets, etc.

D. Development of time standards must be created by recording arrival and departure times at each station.

V. Systems maintenance.

Once the system is installed and functioning, systems maintenance is often neglected. It is important that a maintenance department is established within the installation facilities. Programmers should be assigned the responsibility of finding new ways of improving existing programs and making existing programs more efficient. Documentation should be kept up to date. Personnel should follow established procedures and not be allowed to fall back on old procedures.

SYSTEMS IMPLEMENTATION

TEST

1. MULTIPLE CHOICE: Circle the number to the correct answer.

   a. The ___?___ method of implementing a new system is used for large projects and usually takes longer than other methods.

      1. parallel
      2. piecemeal
      3. conversion
      4. maintenance

   b. The process of installing a computer system is called ___?___.

      1. conversion
      2. scheduling
      3. implementation
      4. controlling

   c. The development of time standards and the use of checks and balances of all accounting procedures are part of ___?___ the implementation plan.

      1. maintaining
      2. converting
      3. scheduling
      4. controlling

   d. ___?___ is the process of changing from one data processing method to another.

      1. Conversion
      2. Scheduling
      3. Implementation
      4. Controlling

   e. Staffing of personnel and preparing facilities are steps that must be ___?___ prior to installation.

      1. tested
      2. converted
      3. scheduled
      4. controlled

   f. A ___?___ installation of a system is used in a large, widespread organization.

      1. piecemeal
      2. parallel
      3. pilot
      4. all-at-once

g. As part of system ___?___, programmers should be assigned the responsibility of finding new ways of improving existing programs and making existing programs more efficient.

1. documentation
2. maintenance
3. control
4. conversion

2. TRUE STATEMENTS: Circle the letters of all true statements.

a. The parallel method of implementation involves the running of the old system for a period of time after the new system has begun.

b. Checking periodically to verify that the prescribed schedule is being followed is a method of converting the implementation plan.

c. Once the system is installed, functioning personnel should be encouraged to follow any procedure they consider easiest.

d. The all-at-once method of implementing a new system can be used if the system is fairly simple, though there are no alternatives if trouble arises.

e. The implementation process begins when the new system has been approved by top management and the new equipment has been placed on order.

f. Between the ordering of equipment and the installing of it all, personnel who will be using the system should be trained either in-house or through vendors.

SYSTEMS IMPLEMENTATION

ANSWERS TO PRETEST

1. Implementation: The process of installing a computer system. This process begins when the new system has been approved by top management and the new equipment has been placed on order.

   Conversion: The process of changing from one data processing method to another. The transition between the old and the new system.

2. Answers may appear in any order and should be five of the following seven.
   - a. Staffing.
   - b. Detailed programming.
   - c. Conversion of files.
   - d. Trial run of information.
   - e. Preparing facilities.
   - f. Train personnel.
   - g. Prepare documentation.

3. Answers may appear in any order.
   - a. All-at-once
   - b. Piecemeal
   - c. Parallel
   - d. Pilot installation

4. Answers may appear in any order.
   - a. Periodic checks.
   - b. Checks and balance of accounting procedures.
   - c. Paper flow controls.
   - d. Develop time standards.

5. Answers should contain some of the following statements.
   - a. Establish a maintenance department within the installation.
   - b. Programmers should be assigned the responsibility of keeping the system as efficient as possible.
   - c. Documentation should be kept up to date.
   - d. Established procedures should be followed.

SYSTEMS IMPLEMENTATION

ANSWERS TO TEST

1. Multiple Choice.

   a. 2
   b. 3
   c. 4
   d. 1
   e. 3
   f. 3
   g. 2

2. True Statements.

   a. T
   b. F
   c. F
   d. T
   e. T
   f. T

APPENDIX

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